McGRAW-HILL INTERNATIONAL

Management Digest®

TECHNICAL • INDUSTRIAL • COMMERCIAL

OCTOBER 1956

OVERSEAS EDITION

In an old gun breech, researchers make new materials to resist high temperatures—p56

ALSO | How Montecatini will build markets abroad—p16
Where the business "doctor" can help you—p21

NOISY GEARS ELIMINATED AUTOMATICALLY

A consistent electronic ear in the Red Ring Gear Speeder has replaced the human sense of hearing which, as we know, varies with the fatigue and mental attitude of the listener.

This electronic sound discriminator is readily adjusted to reject gears at any point within the range of audible noise frequency and intensity.

The Model GSR Speeder for gears and pinions in the smaller sizes is fully automatic. Gears are loaded, run in both directions, with and without a brake load and are either passed or rejected by the electronic sound discriminator as a continuous operation. ***Write for Details.***

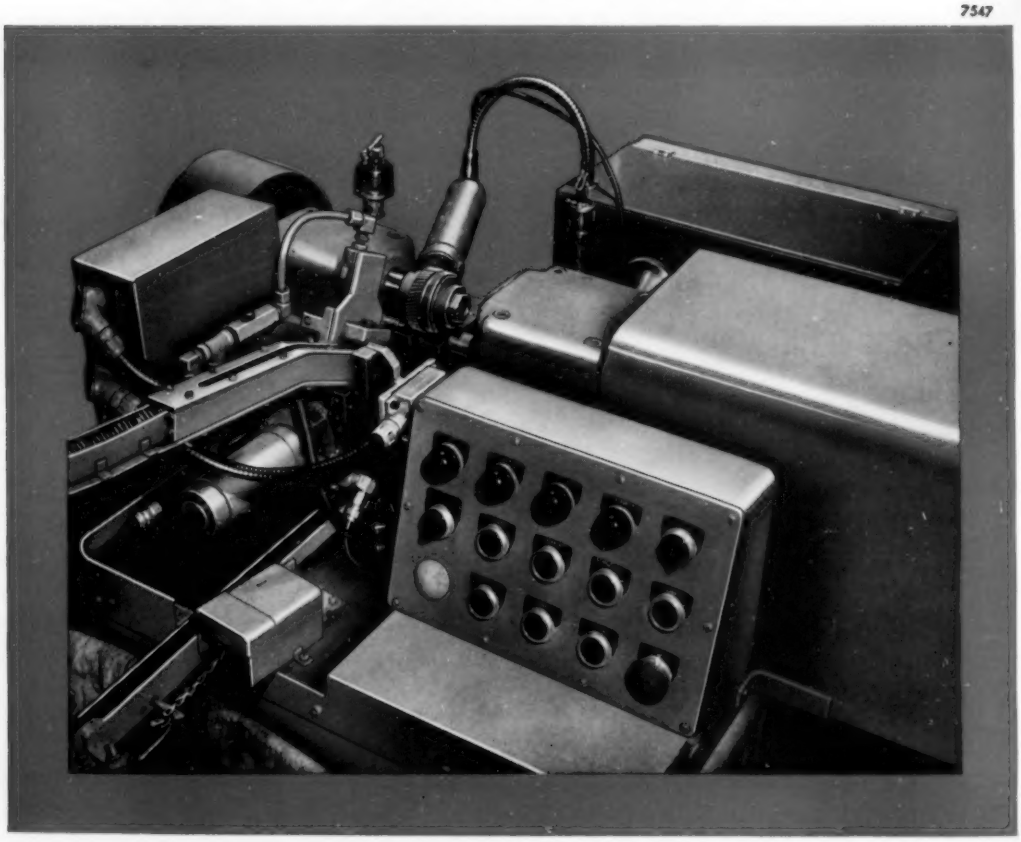
SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORM

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

7547



ALLIS-CHALMERS *Unit* CONSTRUCTION

Simplifies Servicing, Increases Over-all Tractor Output

Today, high-speed construction schedules place a premium on simple-to-service crawler tractor design that holds servicing time to a minimum.

Allis-Chalmers advanced basic design incorporates the principle of unit construction. Major assemblies — such as engine, clutch, torque converter, transmission and final drives — may be removed independently without disturbing adjacent units . . . thus saving valuable time, reducing maintenance costs, and returning the tractor to productive operation much sooner.

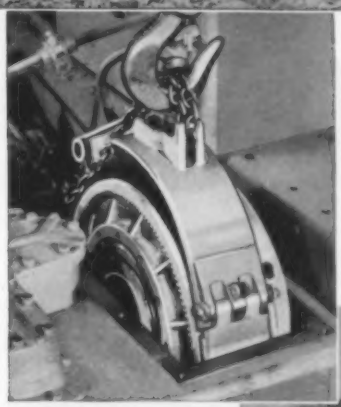
Another invaluable Allis-Chalmers feature is 1,000-hour lubrication intervals. With Positive Seals to keep grease in, dust and water out, truck wheels, idlers and support rollers require lubrication only once every thousand hours . . . this means extra working time every day . . . eliminates need of daily lubrication of track assemblies.

For full details of these and other advanced design features that increase production and lower costs, consult the Allis-Chalmers construction machinery dealer in your area.

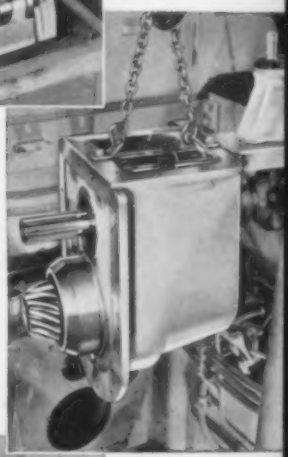
ALLIS-CHALMERS, EXPORT DEPARTMENT MD1056
TRACTOR DIVISION, MILWAUKEE 1, U.S.A.

BUILDERS OF MACHINERY SINCE 1847

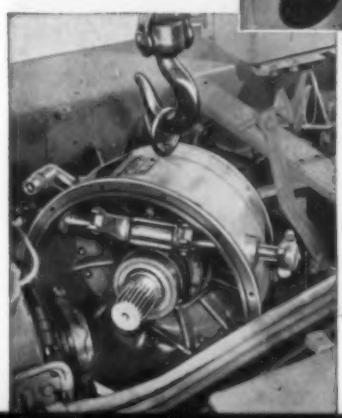
ALLIS-CHALMERS



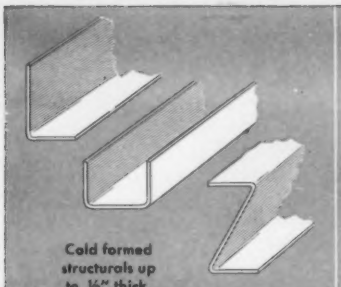
▲ Steering clutches can be removed without disturbing final drives.



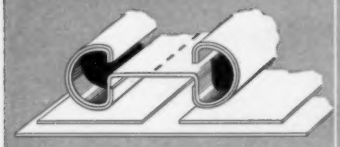
Transmission can be removed without disturbing engine, clutch or final drives.



Torque converter can be removed without disturbing engine, clutch or transmission.

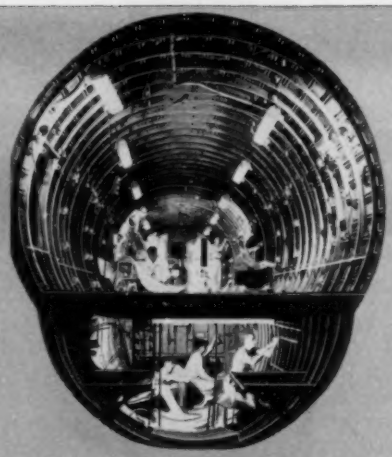


Cold formed structurals up to ½" thick.



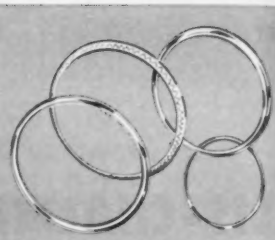
Two or three strips of different materials combined and slit into two identical or different shapes.

Raceway conduit mouldings by Wiremold Co., Hartford, Conn.

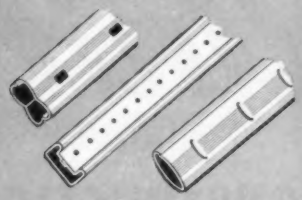


Cold Roll Formed curved ribs and other structurals used in airplanes, metal buildings, etc.

Metal awnings, rolling doors, etc., made from interlocking roll formed slats.



Rings of any size, for a multitude of different uses.



Roll-formed shapes, notched, perforated, indented or embossed.

Lockseam tubular mouldings, in many styles and shapes.

1001 Things Now Being Done By COLD ROLL FORMING

• The basic function of a Yoder cold roll forming machine is, of course, to convert flat rolled strip or sheets at high speed into mouldings, panels, tubular, channel and other shapes.

Quite often, these shapes need further elaboration before being ready for assembly or installation. They may, for instance, have to be curved, coiled or made into rings. Or they may need to be perforated at certain intervals of spacing, notched, embossed, or otherwise finished by additional operations. You may want to combine two or more materials into a finished shape, such as carbon steel with stainless, felt, wood, etc.

These and many other things can be done with Yoder machines at little or no extra cost over and above normal conversion costs, simply by providing special attachments, or by auxiliary units installed in line with the forming mill.

So, to the recognized high economy of the cold forming operation itself, other important production economies may be added. Yoder engineers are at your service in designing equipment of this kind.

The Yoder Book on Cold Roll Forming is a complete text, profusely illustrated, on the art and its scope, the machines, their tooling and application to a multiplicity of mass production needs. A copy is yours for the asking.

THE YODER COMPANY • 5517 Walworth Ave., Cleveland 2, Ohio

ENGINEERING YODER MANUFACTURING

COLD ROLL FORMING MACHINES

ROTARY SLITTING LINES

PIPE AND TUBE MILLS—Electric Weld

McGRAW-HILL INTERNATIONAL

Management Digest®

THE BEST FROM 67 BUSINESS MAGAZINES

Volume 11—Number 10

CHARLES S. MILL.....Publisher
PAUL R. MILLER, JR.....Editor
JOSEPH A. COHN.....Managing Editor

EDITORIAL STAFF
Joseph L. Wiltsee...associate editor
D. Bujara.....editorial assistant
I. Dunay.....editorial assistant

ECONOMICS STAFF
Walter Diamond.....director Foreign Economics Dept.
Dexter Keezer.....director McGraw-Hill Economics Dept.

NEWS BUREAUS
Atlanta.....A. R. Henry
Bonn.....Gerald Schroeder
Cleveland.....Robert E. Cochran
Detroit.....Harry Homewood
Houston.....James A. Lee
London.....William Coughlin
Los Angeles.....John Shinn
Melbourne.....Alicia Grobtuch
Mexico City.....John H. Kearney
Paris.....Robert E. Farrell
Rio de Janeiro.....Peter Weaver
San Francisco.....Margaret Ralston
Tokyo.....Dan Kurzman
Washington.....George B. Bryant
Correspondents also stationed in: Amsterdam, Bangkok, Bombay, Buenos Aires, Cairo, Caracas, Geneva, Istanbul, Johannesburg, Karachi, Madrid, Manila, Rome, Stockholm, and 30 other cities.

ADVERTISING REPRESENTATIVES
New York.....George V. Barnes, K. P. Bliss
Atlanta.....W. D. Lanier
Boston.....George V. Barnes
Chicago.....James A. Shipley
Cleveland.....W. S. Bliss
Dallas.....G. L. Jones
Detroit.....Donald M. Oldroyd
Los Angeles.....Carl Dysinger
Philadelphia.....J. F. Velez
Pittsburgh.....W. S. Bliss
San Francisco.....John Otterson
St. Louis.....James A. Shipley
Amsterdam, Holland...J. A. Teesing
Frankfurt, Germany...George Linder
London, England....Herbert Lagler, C. Anthony Shaw
Paris, France.....Claude Dupuy

Business Manager.....W. J. Maher
Production Manager....H. E. Schorr

McGraw-Hill International
MANAGEMENT DIGEST
Formerly McGraw-Hill DIGEST

Overseas and Latin American Editions are published monthly by McGraw-Hill International Corporation for circulation in all countries of the world except the United States and Canada. Executive, editorial, advertising and subscription offices: 330 West 42nd Street, New York 36, N. Y., U.S.A. Publication office: 99-129 North Broadway, Albany 1, N. Y. Donald C. McGraw, Chairman of the Board; Paul Montgomery, President; Eugene P. Warner, Senior Vice-President; Joseph A. Gerardi, Treasurer; John J. Cooke, Secretary; E. Presbrey Bliss, Vice-President J. E. Blackburn, Jr., Director of Circulation.

Subscriptions may be ordered through Director of Circulation or your local book dealer. Subscriptions to Management Digest are solicited only from management men in business and industry. Subscription orders must indicate position and company name. Subscription rates: $5 for 1 year, $8 for 2 years, or $10 for 3 years; single copy 50¢ (U.S. currency). Second-class mail privileges authorized at Albany, N. Y. Copyright, 1956 by McGraw-Hill International Corporation. Reproduction of items in full or part without written permission prohibited in all parts of the world. For change of address, please send us your complete new address, as well as a clipping of the old envelope showing your old address.

Member—Audit Bureau of Circulations

CONTENTS FOR OCTOBER 1956

WORLD BUSINESS

"Trade and Aid" in the U. S. Election: Eisenhower and Stevenson agree on trade but the winner may face a "high-tariff" Congress.. 15

An Italian Colossus Looks Abroad: Montecatini covers Italy with chemical products. Now it is turning overseas for new markets.. 16

Planning Two Great Projects: In Colombia a vast hydro scheme could raise living standards. In the Gold Coast, aluminum through water power 19

MANAGEMENT METHODS

How to Use the Business "Doctor": A British view of management consultants—how they work, what they do..... 21

Computers Get Down to Business: The electronic "brains" are doing down-to-earth jobs for industry..... 24

A Realistic Measure of Efficiency: Time study, by itself, can cause trouble; a broader approach is vital..... 26

Materials: a Prime Target for Cost Reduction: Be willing to substitute materials. The savings can be impressive..... 28

NEW PRODUCTION TECHNIQUES

What Can Men and Machines Do? Know the ability of man and machine and you have the key to a new approach to quality control. 32

Maintenance: Good Now, Better Later: How a small textile company in Mexico plans its maintenance program..... 34

Now—A Way to Measure Automation: Proposed system divides automation into five steps. The fifth will surprise you..... 37

From Europe: New Conveyor Designs: They do things for materials handling that few other conveyors can do..... 41

MARKETING

Group Exporting—Boon to Small Firms: You can sell overseas, however small your business..... 50

Center of Attention: the Profitable Package: Your product's wrappings sell, or gather dust. Which?..... 52

RESEARCH

A Look at High Temperatures: From ammonia and hydrogen may come a new breed of super metals..... 56

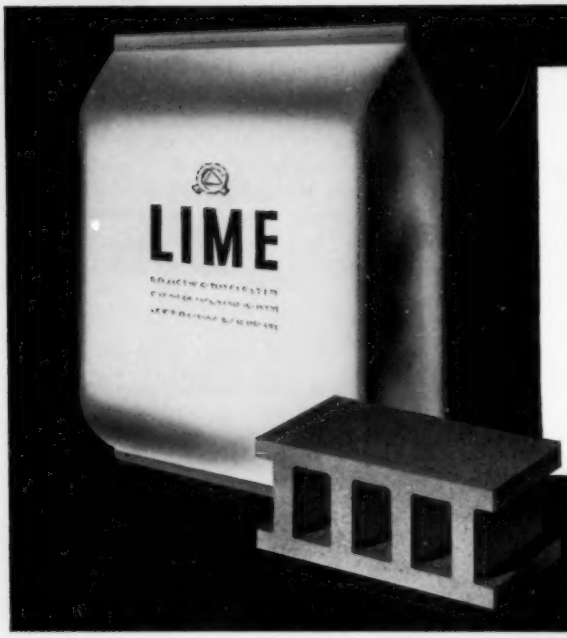
Multiple Virus Killers May Be a New Product of Chemistry: The search is narrowing—the laboratories flirting with success..... 61

PLUS . . .

World Trends 7
Editor's Page 13
You 51
Financial Digest 53
Product Digest 64

PICTURE CREDITS: International Nickel Co.—Cover; Wide World—18 (top)

Tailings Go to Market - Separated by Sturtevant



10% WASTE SCREENINGS CLASSIFIED INTO PROFIT-MAKING PRODUCTS

Hills of bothersome tailings at a Midwestern rock-crushing plant are being classified into saleable products — agricultural limestone and sand for cement blocks — by a 10 ft. Sturtevant Air Separator. No extra men are needed to supervise the almost automatic unit — operating in rugged outdoor service. Screenings previously thought to have no commercial value are now going to market — **at a profit.**

THE SEPARATOR THAT UPPED 40 TO 400 MESH OUTPUT AS MUCH AS 300%

Sturtevant Air Separators range from 3 to 18 ft. in diameter: deliver fines from 40 to 400 mesh at rates as high as 65 tons per hour . . . in the cement industry, have a tested record of increasing mill capacities from 25 to 300% while lowering power consumption as much as 50% — when used in closed circuit with grinding mills.

Designed to cut costs and build profits, Sturtevant Air Separators give a lifetime of high-efficiency, low down-time service. Rugged construction plus easy accessibility for quick maintenance (typified by the "Open-Door" design in other Sturtevant equipment) assure more output per machine year.

Write today describing your problem. Please include information on material, process and desired capacity.

Address: Sturtevant Mill Company,
141 Clayton St., Boston 22, Mass.

STURTEVANT

Dry Processing Equipment

The "OPEN-DOOR" to *lower* operating costs over *more* years

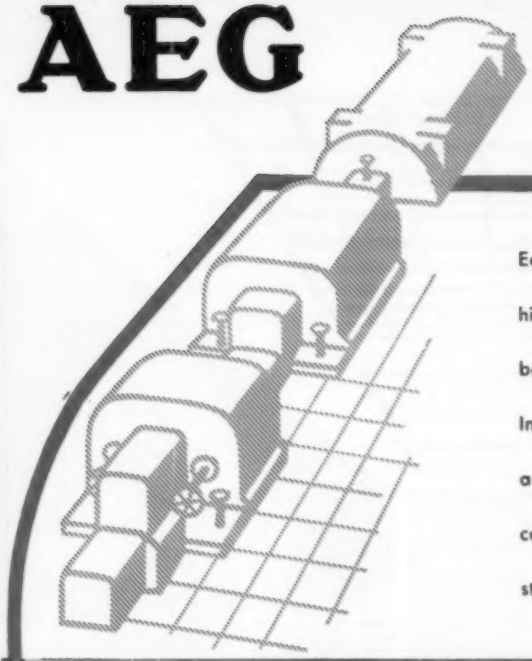
CRUSHERS • GRINDERS • MICRON-GRINDERS • SEPARATORS
BLENDERS • GRANULATORS • CONVEYORS • ELEVATORS

What Can a Sturtevant Air Separator Do in Your Pulverizer System?

Controlled centrifugal whirl by balancing forces separates rapidly, efficiently, cement, lime, clay, talc, ceramics, refractories, phosphates, coal and many other materials. Also used for selection of pigments, limestone, fillers, plastics, oyster shells and abrasives. Write for Sturtevant Bulletin No. 087.

AEG

The most up-to-date Turbine Test-Bay

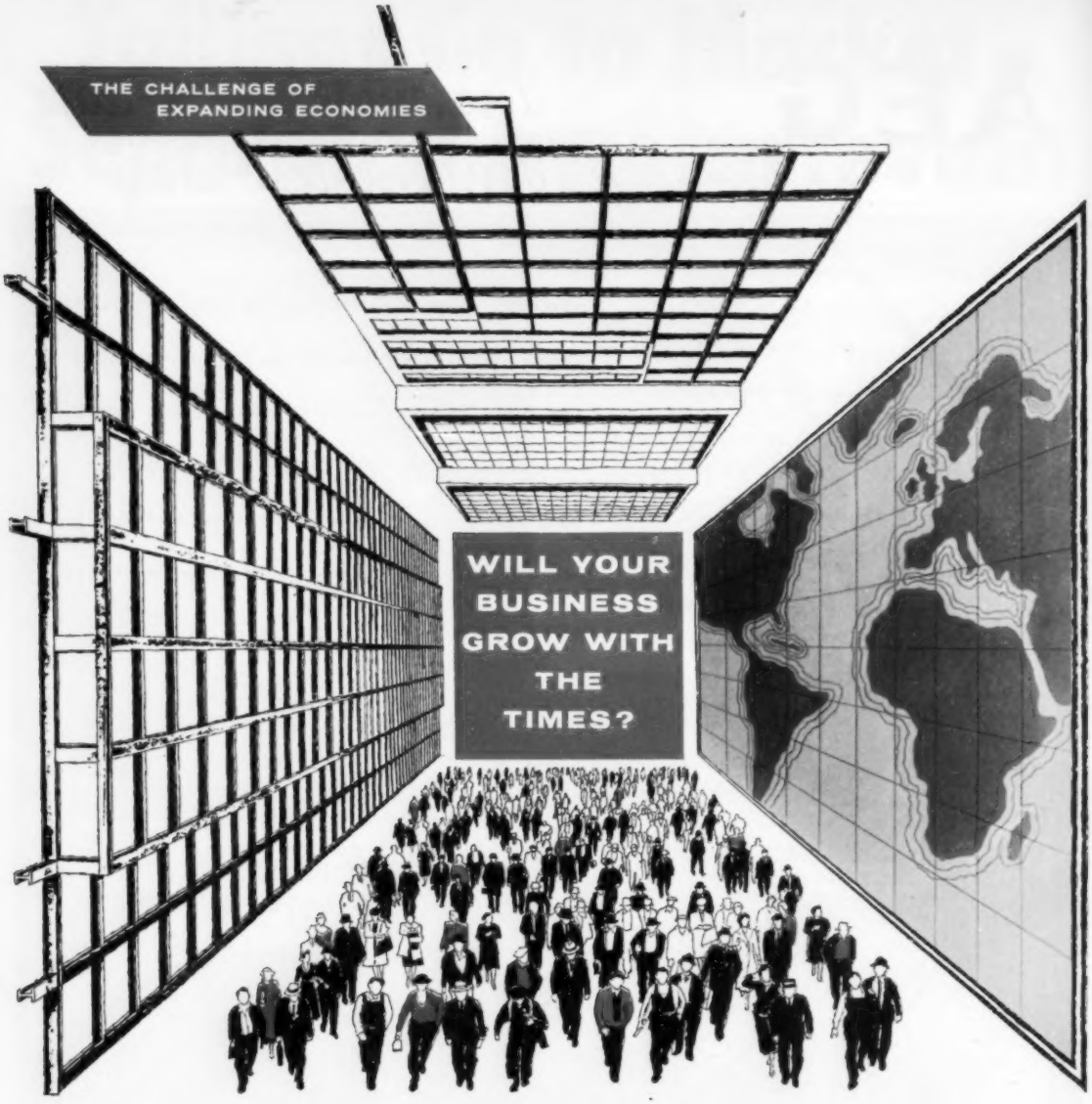


Economic operation of steam-turbine power-stations means higher pressures and temperatures. Turbines must therefore be factory tested according to actual working conditions. In new test-bay of Turbine-Factory, Berlin, the most modern and efficient in Europe, all types of turbines, even the largest, can be tested, and research work undertaken for future constructional development.

AEG-Turbine test-bay under construction

ALLGEMEINE ELEKTRICITÄTS-GESELLSCHAFT

Berlin (West) EXPORT DEPARTMENT Frankfurt (Main)



Throughout the free world today, a new spirit of economic progress is surging. In the next decade, increasing populations and rising standards of living will mean expanding markets everywhere. The need for sustained and ever-increasing productivity must grow to keep pace with this economic expansion.

Will *your* business grow to get its share of these increased needs and demands? How do you plan to meet this formidable challenge?

These are decisions you face now—and your answers, more than ever before, must rest on facts.

To speed the flow of information vital to good management, IBM has pioneered the world's most complete line of data processing machines. During 1955 alone, IBM announced an important data processing innovation or improvement every two weeks!

Now ranging from versatile punched card equipment to the most advanced electronic data processing machines, IBM systems are providing management with more efficient operations, better controls, and more timely reports. And *every working day*, another IBM electronic system is delivered somewhere in the world.

To help you with today's management problems . . . to guide you in planning for the future . . . to pave the way for growth in step with an expanding economy . . . there never was a better time than now to check the opportunities IBM offers you and your company.

IBM WORLD TRADE CORPORATION

Offices In Principal Cities Of The World

DATA PROCESSING . ELECTRIC TYPEWRITERS . TIME-RECORDING EQUIPMENT

WORLD TRENDS

ELECTION EVE

The U. S. A. approaches the presidential election in a period of high business activity. Some think it may be "too high." Businessmen and consumers continue to make optimistic spending plans; prices move upwards, carrying the cost-of-living to an all-time peak.

The nation's monetary authorities have been convinced that serious inflation threatens. That is why, as Management Digest went to press, they decreed a new, very restrictive credit policy. The prime bank loan interest rate went to the highest point since the 1930s.

Only time can tell whether this "tight" money policy will damage the boom, or whether it represents just the right amount of restraint.

Worry about inflation adds to the business uncertainty that always comes just before an election. The news is full of charges, countercharges, rumors about (1) the state of the nation, (2) the state of the world, and (3) the state of the President's health.

After November 6, the U. S. A. will return to a more normal mood. And if inflation can be checked, the 1956-1957 business outlook is excellent.

Who will win on November 6? Predictions are dangerous. But as of early September, it looked as if President Eisenhower had the edge.

MORE FARM SURPLUSES

Washington's effort to dispose of surplus farm commodities outside the U. S. A. is gathering momentum. So far, the two-year-old program has sold wheat, cotton, rice, dairy products, other commodities for $1,000-million in foreign currencies. And the Congress has approved further sale of another $1,500-million worth of surpluses.

Several other exporters of farm products accuse the U. S. A. of dumping its surpluses. Meanwhile, Washington, struggling with the political problems of the surplus, claims that its disposal program is providing some important benefits for business.

Of the $1,000-million sales so far, U. S. and foreign governments have agreed to loans totalling $500-million for local development. Here is how the scheme works:

Local currency funds, used by governments to pay for the farm commodities, are loaned out for worthwhile projects. A pattern has been set for lending this money to private, as well as government, business development. Farm improvement, power production, highways, paper mills, mining—in a half dozen countries—are already benefitting.

LATIN AMERICA'S OIL

Uncertainty in the Middle East focusses attention on Latin America's oil potential. Important new investment is going into the oil search.

Venezuela—already the world's second largest producer—hopes to expand its reserves rapidly, and is right now granting new concessions to oil companies (MD, September). But there is much activity elsewhere:

Colombia is launching a major new exploration and development drive. In Peru, the search for oil continues in the difficult eastern jungle areas of the country. Bolivia has a new oil law, and is just now attracting major new investments by outsiders. Chile is drafting more modern oil legisla-

Turn the page for more WORLD TRENDS

tion. In Mexico, Costa Rica, Guatemala, and Cuba (where 25 drilling rigs are now active), the tempo of oil activity is increasing.

Argentina and Brazil suffer the most severe oil deficits. Now Buenos Aires says that the government's oil monopoly can double production by 1959, by spending $250-million and getting technical help and equipment from outsiders. But the oil search will put a heavy financial strain on the government—especially since Argentina does not want to grant oil concessions to private companies.

Brazil's oil situation is even more difficult. Like Argentina, Brazil restricts exploration and development concessions to the state-owned oil company. So the government is going full-speed ahead with a four-year, $450-million drilling program—and hopes for foreign credits to help.

(Whether or not Brazilians find oil, they can boast another new mineral resource: A zinc ore body, discovered several years ago in Minas Gerais state, now appears to be one of the largest and richest in the world.)

MEN AT WORK

British trade union leaders have adopted a new policy for the "age of automation." Instead of fearing new automatic machinery, and using it as a strike issue (MD, June), the Trades Union Congress urges British labor to welcome the new technology, adjust to it, try to get as large a share as possible out of the increasing productivity it promises. TUC's policy statement came amid warnings that the recent improvement in Britain's economic situation would be endangered by rising production costs—especially labor costs.

More automation, not less, is what the U. S. A. needs, according to an executive of Sylvania Electric Products, Inc. By 1975, a gross national product of $850,000-million is possible. To achieve this, and to reduce the work week to 32 hours, would require a labor force of 105-million. Since forecasts indicate a workforce of only 82-million in 1975, more—and yet more—mechanization is needed.

The shortage of technical personnel is bad enough right now—and American companies are searching everywhere for engineers. Note this recent, and typical, advertisement in a Turin (Italy) newspaper:

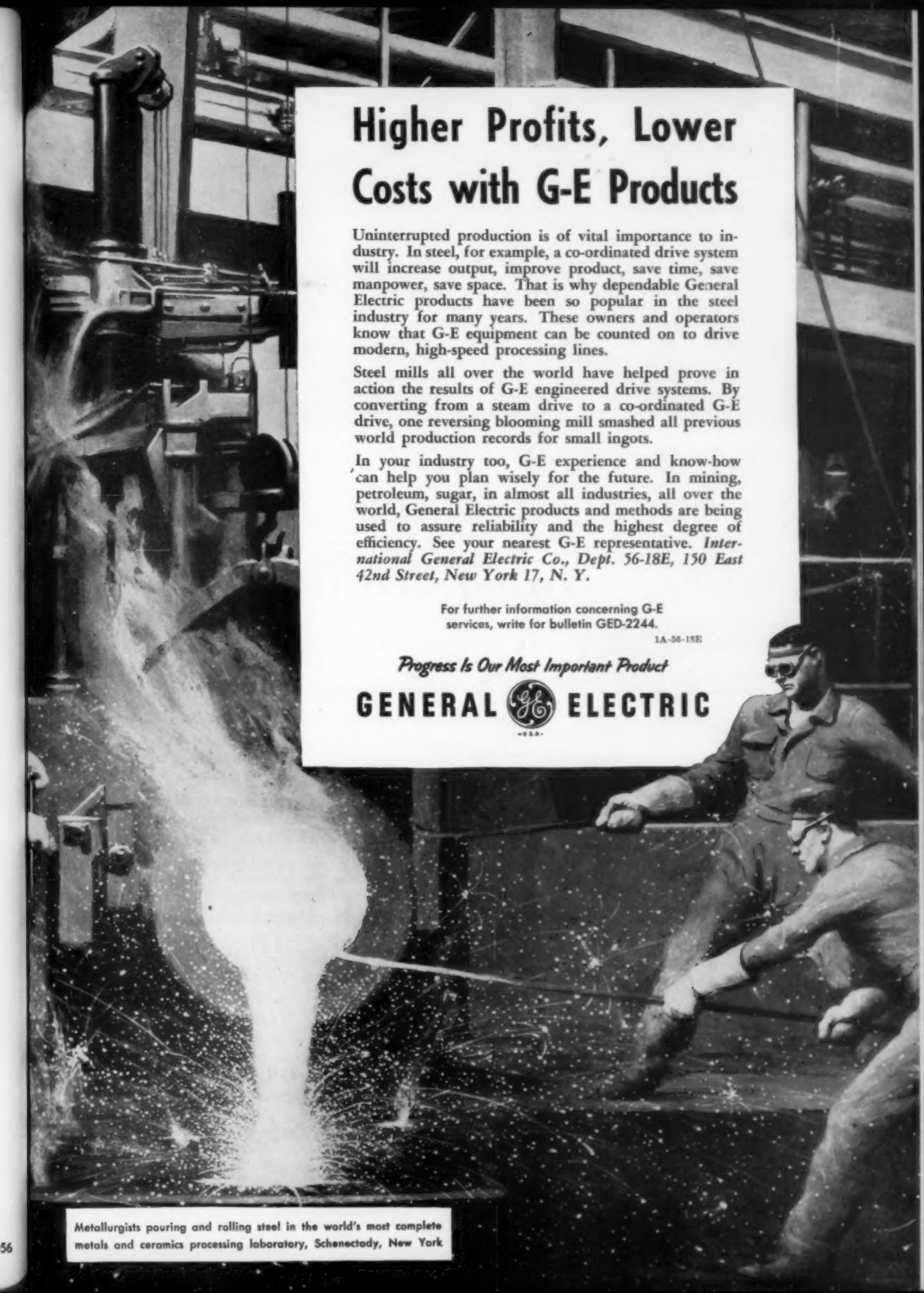
"A limited number of engineers . . . interested in becoming United States citizens are offered permanent positions . . . in the General Electric Co. at Cincinnati, Ohio." The advertisement included a description of the charms and cultural benefits of life in Cincinnati.

OPPORTUNITY

For the first time, Puerto Rico is looking for new industry from outside the U. S. A. The self-governing Caribbean commonwealth, associated with the United States, has made great progress in its industrialization drive. Over 400 new industries have been established since 1948; living standards are rising, the market is growing.

A new industry in Puerto Rico gains a duty-free entry into the American market, as well as a useful headquarters for all Western Hemisphere trade. Puerto Rico grants a 10 year tax exemption (there are no federal U. S. taxes), plus other benefits, such as financing and training facilities.

It is a good opportunity for many light industries. The labor pool is large; wage scales are below those of mainland U. S. A. (though they are somewhat higher than European levels). If you are interested, write direct to the Economic Development Administration in San Juan, Puerto Rico.



Higher Profits, Lower Costs with G-E Products

Uninterrupted production is of vital importance to industry. In steel, for example, a co-ordinated drive system will increase output, improve product, save time, save manpower, save space. That is why dependable General Electric products have been so popular in the steel industry for many years. These owners and operators know that G-E equipment can be counted on to drive modern, high-speed processing lines.

Steel mills all over the world have helped prove in action the results of G-E engineered drive systems. By converting from a steam drive to a co-ordinated G-E drive, one reversing blooming mill smashed all previous world production records for small ingots.

In your industry too, G-E experience and know-how can help you plan wisely for the future. In mining, petroleum, sugar, in almost all industries, all over the world, General Electric products and methods are being used to assure reliability and the highest degree of efficiency. See your nearest G-E representative. *International General Electric Co., Dept. 56-18E, 150 East 42nd Street, New York 17, N. Y.*

For further information concerning G-E services, write for bulletin GED-2244.

1A-56-18E

Progress Is Our Most Important Product

GENERAL ELECTRIC

Metallurgists pouring and rolling steel in the world's most complete metals and ceramics processing laboratory, Schenectady, New York

Time-tested and performance-proved the world over in . . .

Ten billion kilometers of transportation service!*

The 'Jeep' Truck. This all-purpose 4-Wheel Drive Truck hauls loads of more than a ton, in good weather or bad. In low-low gear it climbs grades as steep as 65%, fully loaded.

The Universal 'Jeep'. The "go-anywhere" Universal 'Jeep', with the extra traction of its 4-Wheel Drive, moves out ahead of roads to carry cargo where other vehicles can't go.

New model CJ-6 'Jeep'. Longer wheelbase, 50% more cargo area, and increased payload capacity. It has all the features that made the standard 'Jeep' famous.

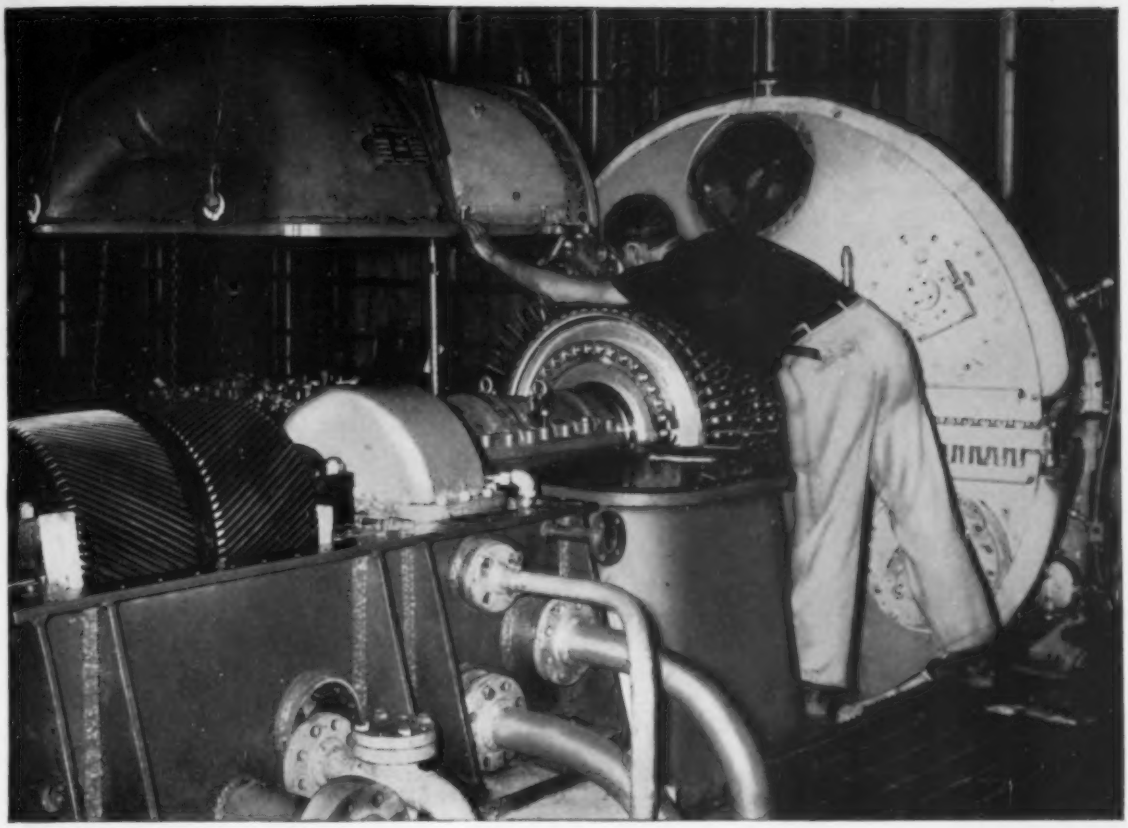
In virtually every country of the free world—on the plantation, in industry and public service—'Jeep' vehicles are the accepted symbol of rugged, go-anywhere transportation. On the road or off—in good weather or bad—these vehicles have acquired a performance-proved reputation for dependable year around transportation of men and cargo in the most difficult situations.

Willys-Overland Export Corporation's world-wide network of Distributors and Dealers have a performance-proved reputation, too! Their years of accumulated experience will help you solve your transportation problems. And they will supply you with genuine Willys parts and authorized service that assure continued top performance of your 'Jeep' vehicles.

The **'Jeep'** *family of 4-Wheel-Drive vehicles*

Willys-Overland Export Corporation, Toledo 1, Ohio, U.S.A.

*This is an understatement. Some estimates place the service at more than fifty billion kilometers.



Another Westinghouse Gas Turbine goes on the line

Looking for an easy-to-install prime mover? Or a reliable source of electric power?

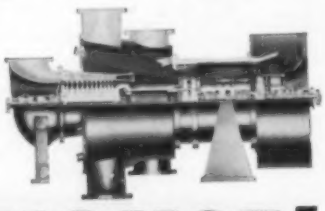
In either case you'll find what you need in the new Westinghouse gas turbine. This surprisingly flexible power plant comes in capacities from 1800 hp (1250 kw) to 20,000 hp (15,000 kw). It works on gaseous or distillate liquid fuels, and requires little or no water . . . making it particularly ideal in areas where water is short or gas is plentiful. And its light weight plus vibration-free operation minimize the expense of supporting foundations.

You're in good company when you specify Westinghouse gas turbines for uses such as compressor drive, pipeline pumping, mobile, emergency, or normal power supply. The Mene Grande Oil Company, for example, uses these units . . . one of which is illustrated during installation . . . to convert natural gas into electric power for their eastern Venezuela oil fields. And Creole Petroleum Corporation is harnessing 12 Westinghouse gas turbines to pump natural gas into oil deposits below Lake Maracaibo. This operation forces the oil upwards, enabling Creole to recover substantially more of the "black gold" than with more conventional methods.

If you want more power quickly, find out the facts about Westinghouse gas turbines. Write for free booklets: B-5887 for electric power generation; B-5859 for mechanical drives.

N. F. Emig

N. F. Emig, *Supervisor*
Steam Section



Cutaway view of Westinghouse 5000-hp gas turbine. Red area shows path of hot gases from combustion chamber (L.) through power turbine to exhaust (R.). View highlights simple, compact design of turbine.

WATCH WESTINGHOUSE!

WHERE THE FUTURE IS ALREADY IN PRODUCTION

WESTINGHOUSE ELECTRIC INTERNATIONAL COMPANY, 40 WALL STREET, NEW YORK 5, U.S.A.

BETHLEHEM STEEL

THE MAN FROM BETHLEHEM STEEL

Wherever you are, you are close to Bethlehem Steel . . . to its products and to its representatives.

Bethlehem products may be closer to you than you think . . . in the form of alloy steels, plates, structural shapes, sheets, strips, tin plate, pipe, wire products, rods, bars, rails, all of which are part of your daily life.

And friendly Bethlehem offices and representatives are surely neighbors of yours because they are in all corners of the earth . . . at convenient locations where they can be of help to you. It is easy to do business with Bethlehem. Bethlehem Steel Export Corporation, 25 Broadway, New York 4, U.S.A. Cables: "BETHLEHEM, NEWYORK."

Bethlehem's great Sparrows Point plant in the Port of Baltimore, U.S.A., is the world's largest steel mill located on tidewater. Products for export can be loaded from this plant directly aboard ship.

Offices and representatives in all principal cities of the world

804E

NEW YORK CITY
OCTOBER, 1956

How to Get More Out of Management Digest

YOU ARE A BUSY MAN. You are looking for useful ideas about new processes, products, and methods; you want to keep informed on important trends in world business and technology. My task is to see that you get-up-to-date information in a concise and interesting manner. Each month I shall try to do that job more effectively.

You may be able to increase the effectiveness of your own reading in MANAGEMENT DIGEST. Here are some suggestions:

Take a quick look as soon as each issue arrives. Check the contents page. There may be an article that directly affects your business. You will want to read it right away, and call your associates' attention to it.

Later, at your leisure, read the magazine through. While you are reading, consider why a new process has been developed, or a new trend has become apparent. You will probably not find a specific idea that you can put to work immediately, just as it appears in the magazine. The important thing is to cultivate a reflective, "adaptive" reading mood. The article is just the beginning. It will suggest an approach to a problem that may be extremely valuable in your business. Then, adaptation is up to you.

If you are an engineer, do not limit yourself to technological articles. If you are a commercial man, do not fail to read articles about good personnel practices or finance management. A general understanding of all business problems cannot help but increase your efficiency in your own specialty.

Pass your copy of MANAGEMENT DIGEST to associates. Occasionally you will want to tear out a page or two, and send it on. Some readers get two copies each month —one for a permanent file, one to pass on and clip. Some readers request a number of reprints from us—and send these reprints to employees, customers, industry colleagues.

Read the advertisements in MANAGEMENT DIGEST. They bring you valuable ideas, and news of tools, equipment, and services. Of course, an advertisement cannot tell you all you want to know. So write to the companies in question. Be sure to describe your needs carefully, so the company can answer your questions more intelligently. Write direct—or write to me, and I shall forward your request.

Do write to me if you want more complete information on anything you see in the magazine. Often I can send you a copy of the original material on which an article is based, as well as additional information.

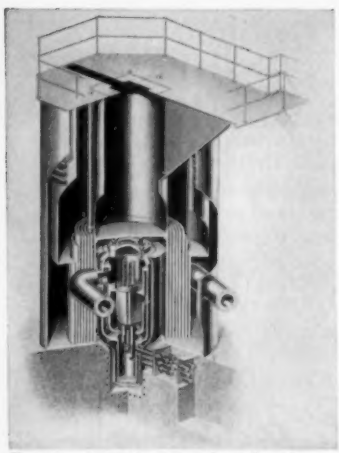
This is the first "Editor's Page" MANAGEMENT DIGEST has published. And I seem to have done all the talking. I hope in the future you will think of this as a "Readers' Page" as well—a forum for letters from businessmen everywhere. Any observations and experiences that you want to share with colleagues in the world of management will be considered for publication here.

Thank you—and very best wishes.

Paul R. Miller, jr

Army Package Power Reactor (APPR) was designed and built by ALCO, *scheduled for completion in early 1957. Reactor will be operated at a heat rate of 10,000 Btu per second (10,000 kw). In construction at Fort Belvoir, Va., vapor container is at left, turbine room at right.*

YOU CAN GET ATOMIC POWER NOW



Reactor, reactor vessel and primary shielding of ALCO *APPR. Control rods and drive are shown top and bottom. Shielding consists of concentric steel cylinders with layer of water between each.*

ALCO's pressurized-water reactor plant is completely designed and engineered; scheduled for operation in early 1957. Similar plants can be purchased to generate commercial power.

Early next year, ALCO's atomic power plant will be in operation generating reliable power. ALCO is building the plant under the first fixed-price reactor contract awarded by the Atomic Energy Commission. Similar plants are available now to generate commercial power.

Design and engineering are complete. As a result, the cost of ALCO's atomic power plants, to about 12,000 kw, is lower than experimental reactors. ALCO's new nuclear criticality facility will further lower costs in reactor testing. Delivery time? Much faster than you'd expect.

Direct utilization of ALCO's atomic plants is economically justifiable in many locations where conventional fuel costs are high, transmission expensive or the location itself inaccessible. In such areas, an ALCO atomic power plant can mean a saving.

For full information relative to your specific project cable LOCOMOTIVE, New York.

ALCO

ALCO PRODUCTS, INC.
Foreign Sales Department
30 Church Street
New York 8, New York

Locomotives · Diesel Engines · Nuclear Reactors · Heat Exchangers · Springs · Steel Pipe · Forgings · Weldments · Oil-Field Equipment

"Trade and Aid" in the U.S. Election

THE CANDIDATES: Eisenhower and Stevenson seem to agree in their approach to trade policy.

THE OUTLOOK: But whoever wins will have to face an increasingly "high-tariff" Congress.

This month, the U.S.A. moves into the last stages of its quadrennial "election fever." Like all campaigns, this one is confusing—particularly to businessmen outside the United States. How, he asks, will the election affect vital problems of world business?

The candidates present familiar faces. Yet there are these differences between Eisenhower and Stevenson in the 1952 campaign, and the same men now:

Adlai Stevenson, a "reluctant" candidate in 1952, eagerly sought the 1956 battle. In 1952, his job was to defend the record of a Democratic administration that he did not always agree with. Now his efforts are devoted to advancing new ideas, and to attacking the Republican record—leading a more united Democratic party.

Dwight D. Eisenhower, a political novice in 1952, has grown experienced and confident. He feels sincerely that his work for world peace is not yet finished, nor is the job of reshaping the Republican party complete.

To an outsider, perhaps the most obvious fact about the two candidates is the similarity of their approach to world problems. Both are moderates, liberals, "internationalists," if you will. Both head basically "middle-of-the-road" parties. Both are free of commitments to extremist factions. Both deeply believe that the nation—and the world—are on the threshhold of a new and promising future.

Stevenson and Eisenhower's views on American foreign trade policy are almost identical. Both favor maximum expansion of world trade by freeing it of government restrictions. Both would resist domestic pressures for high-tariff or quota protection.

Stevenson would probably be more outspoken in his public opposition to the high tariff men. But as far as practical policy is concerned, the results would be the same. Any government is going to have to give ground from time to time on specific trade issues.

The issues they compromise on might be different, however. Stevenson might be more sympathetic to demands of southern, Democratic cotton interests than Eisenhower has been. But he might be less sympathetic to the pleas of northern, Republican watch manufacturers. Yet on major questions of principle, both men would fight hard against protectionism.

Stability of American trade policy would be the underlying theme of both men as president. Neither would ask for radical tariff cuts. But both would strongly recommend such measures as extending the Reciprocal Trade Agreements Act.

There might be more of a difference in foreign aid and development policy under a Stevenson administration. Eisenhower is more concerned with winning a free hand to administer the program, and with giving it a permanent character, than he is with the program's size in terms of money. Eisenhower leans strongly to loans, rather than grants. Also, another Eisenhower administration will be more insistent on encouraging, and relying upon, private U. S. foreign investment.

Both men believe that the changing nature of the world power struggle demands more emphasis on economic policy, as opposed to military. But neither they nor their advisers have yet devised a clear formula for action.

Adlai Stevenson seems to feel a greater sense of urgency about aiding underdeveloped countries than does the Republican leadership. He and his associates charge that the present government has not moved quickly or boldly enough to meet increasing Soviet economic strength, and the revolution of less developed lands against poverty and foreign domination.

This conviction, plus the strong Democratic attachment to the foreign aid concept, probably would lead Stevenson to advance more ambitious economic development programs for Asia, Africa, Latin America. Stevenson personally feels that more U.S. funds should flow through international channels—such as the United Nations.

But it is one thing to espouse policies, and another to push them through the U.S. Congress.

Stevenson might run into more difficulty than Eisenhower in getting liberal foreign economic legislation through the Congress. (Much depends, of course, on whether there is a Democratic majority, as there is now, or a Republican Congress.) Certainly Stevenson would face vigorous Republican opposition. Without Eisenhower's influence, many Republicans would follow their inclination to a more highly nationalistic foreign policy. In other words, where Eisenhower can count on many Democrats to back his internationalist policies, Stevenson would face very strong Republican opposition.

And Stevenson faces a rising tide of trouble in his own party. The rapid industrialization of the American South has converted it from a stronghold of free trade to a protectionist center.

Finally, any appraisal of the U. S. foreign economic policy outlook must take into account two imponderables: (1) the course of world diplomacy; and (2) the trend of U. S. business (see page 7).●

Montecatini's World

PLANT: a vast mineral-chemical empire, Italy's largest industry.

PRODUCTS: from aluminum to plastics to zinc—plus 8% of Italy's power.

PLANS: Montecatini has grown rapidly with Italy. Now it wants to exploit more fully its products and processes around the world.

Factories and mines owned by Montecatini concern ●

An Italian Colossus Looks Abroad

Digested from BUSINESS WEEK, Aug 18, p164

FOR almost 80 years, Montecatini, Societa Generale per l'Industria Mineraria e Chimica, has stayed close to Italian soil. With some 120 mining, production, and research units, this chemical-mineral empire spans Italy—from the Alps to Sicily. Its products cover the alphabet—from aluminum and fertilizers to oil and zinc.

Historically, Montecatini has sustained its growth on primarily Italian resources and production. But today, the company is flexing its muscles—ready to fight for a stronger position for its products and patents in world markets.

Certainly Montecatini has not limited itself solely to Italy. Its name is as well known—and its reputation as fully respected—as the U. S. A.'s du Pont or Britain's Imperial Chemical Industries. There are Montecatini affiliates in France, Germany, Belgium, and the Netherlands. There are at least 101 plants around the world that use Montecatini patents and processes. In 1955 alone, the company was awarded contracts for no less than 43 chemical installations in 12 nations. Montecatini's foreign sales in 1955 were a comfortable $40-million—out of a total sales (including affiliates) of over $375-million.

One major target for Montecatini is North America—and the U. S. A. Already, at least 20 U. S. chemical and oil companies are interested in Montecatini's plastic resin, polypropylene, for possible licensing (See MD, July, 1956). And Montecatini management is considering a joint venture with a U. S. oil company, or establishing American subsidiary.

Elsewhere in the world, Montecatini sees larger potential markets both for fertilizers and other chemicals, and for its newer plastics. The company is considering aluminum production in French Guinea, and perhaps the Congo; it is erecting a power plant in Pakistan, as well as building many plants based on the famed Fauser-Montecatini processes for nitrogen fixation.

I. What It Looks Like

Ask a chemical industry specialist how Montecatini ranks in terms of assets, world wide, and he will place it in fourth or fifth spot. In terms of sales, it probably ranks ninth (see table, opposite page). But in terms of diversity, Montecatini probably outranks them all. Just now U. S. chemical companies are moving toward greater diversification—into aluminum, for example. Montecatini has been diversifying on a much larger scale for over two decades.

Strictly speaking, Montecatini is not a monopoly. There are 5,500 other Italian chemical companies. But of the 170,000 workers on the industry payroll, 62,000 work for Montecatini.

The company's impact on the Italian economy is powerful. It produces 35,000 tons of aluminum, 57% of Italy's total. It mines 1.2-million tons of pyrite annually—89% of Italian output. It produces 80% of Italian bauxite, 64% of phosphates, the major proportion of all chemical products. Montecatini power plants generate 2,600-million kilowatt hours of electric power—8% of the Italian total.

A year and a half ago, Montecatini struck oil. It is a 50/50 partner with the U. S. A.'s Gulf Oil Corp. in a company which brought in the first discovery well in the Abruzzi mountains. And, looking further to the future, Montecatini has begun serious prospecting for uranium in Italy

—and hopes to be an important factor in Italian atomic development.

Not all Montecatini operations are profitable. While fertilizers and insecticides are big sellers, Montecatini's sulfur production is lagging, mainly because of antiquated methods. But diversity, research, and success in getting protection against many imports make up the difference. While sulfur is not paying, aluminum is. And Montecatini says it is working on a "revolutionary" new sulfur extraction process.

Altogether, the company has about 700 first class engineers and scientists, in addition to researchers in Italian universities who are paid on a fee basis (such as Prof. Guido Natta, of Milan Polytechnic Institute, developer of polypropylene).

Montecatini management is well connected with the Italian government. The top man today is Count Carlo Faina, chairman and president. Under him, at the policy-making level, are several leading scientists (Ing. Giacomo Fauser is one). Operations are run by two managing directors: Faina, who specializes in finances; and Piero Giustiniani, the technical boss.

Montecatini's managers will not let outsiders study the company's methods of operations too closely. But Italian businessmen who have worked closely with Montecatini say that Faina, from his desk in the marble-faced headquarters in Milan, knows what is happening everywhere in the organization.

II. How It Grew

The Italian colossus started in 1888—with the discovery of copper at Montecatini, a small Tuscan spa just above Florence. The company branched out into chemicals during the years up to 1910. Then World War I carried Montecatini into explosives and a wider range of chemicals.

Montecatini grew quickly thereafter—by buying into, or buying out, existing companies. It would chop off unprofitable plants or product lines of newly acquired companies, put money into those areas that needed swift expansion.

During the days of Mussolini,

Ten Great Chemical Companies: Growing Larger, More Diversified

E. I. DU PONT DE NEMOURS & CO. (U.S.A.) is largest chemical producer. 1955 sales: almost $2,000-million, up 210% since 1945. Du Pont has spent $1,200-million for expansion in a decade, constantly adds new products to its broad chemical line. Du Pont owns 22% of stock of General Motors; also investments in Latin America.

UNION CARBIDE & CARBON CORP. (U.S.A.) increased sales to $1,187-million last year, up 28% in a year, and invested over $100-million. Activities: alloys and metals, chemicals, plastics, industrial gases, batteries, atomic energy. UCC exports and foreign affiliates are expanding.

IMPERIAL CHEMICAL INDUSTRIES LTD. (U.K.) boasts some 115,000 employees, 121 plants and offices, in Britain alone, plus overseas subsidiaries in 22 nations. ICI makes dyes, alkalis, petrochemicals, plastics, nonferrous metals. 1955 sales were $1,151- million, exports $200-million.

ALLIED CHEMICAL & DYE CORP. (U.S.A.) produces acids, other heavy chemicals, alkalis, ammonia and other nitrogen products, dyes, coal derivatives, building materials, plastics. 1955 sales were $628-million, up 18%. Allied is trying to expand exports, especially in Latin America.

OLIN MATHIESON CHEMICAL CORP. (U.S.A.) has diversified by acquiring other companies. It produces chemicals, drugs (Squibb), metal products, arms and explosives, paper, will soon enter aluminum production. 1955 sales rose to $560-million, plus foreign sales of $47-million.

DOW CHEMICAL CO. (U.S.A.) is world's largest magnesium producer. The metal accounted for 9% of sales of $565-million (in year ended May 31, 1956). Chemicals accounted for 59%, plastics, 32%. Sales increased four times in past decade, while company invested $650-million.

MONSANTO CHEMICAL CO. (U.S.A.) has increased sales five times since 1945—to $522-million. It produces a broad line of chemicals and plastics, and recently acquired an integrated oil company. Very active abroad, with subsidiary and affiliated plants in 12 nations.

AMERICAN CYANAMID CO. (U.S.A.) makes industrial and agricultural chemicals, medical supplies, pigments, plastics. Its Lederle Laboratories noted for work in antibiotic drugs. Sales, at $451-million, have doubled in past seven years. Plants in seven nations.

FARBENFABRIKEN BAYER AG. (Germany) helped form the great I. G. Farben trust in 1916, now is largest of successors. Bayer is booming: sales, at $360-million, were up 19% over 1954. Exports rose 22%, and account for 38% of total sales of chemicals, drugs, photo products, fibers.

FARBWERKE HOECHST AG. (Germany), another IG successor, makes chemicals, drugs, dyes, plastics, building materials, welding tools. Sales: $302-million, 30% exported. Hoechst, Bayer, and Badische Anilin (another IG company) are again working closely together.

Montecatini followed the Fascist program of self sufficiency, with a government-guaranteed market for existing and new products. There were apparently no financial troubles: It is rumored that the government held 35% to 40% of the company's stock. (Today, heirs of the founder, Guido Donegani, reputedly own 10%; private banks, 10%; the government, 8%; financial institutions linked to the Vatican, 25%; the rest scattered among Italian and foreign investors.)

After the war, a new president —Giuseppe Mazzini—went to work rebuilding, reorienting, and improving the company, damaged by war and Fascism. Better labor-management relations were a priority task. By offering more economic benefits, Montecatini has succeeded as well as any Italian company in keeping Communists clear of its plants. Montecatini has built some 7,000 homes for employees, instituted liberal bonus, medical, and retirement plans.

Now, under Count Faina and Ing. Giustiniani, Montecatini is ready to expand rapidly—both at home in Italy, and abroad. ●

A big, fast, modern airliner takes off from Britain . . .

. . . while the "Tin Goose" prepares to fly in California

This month, the world's largest, fastest, quietest turbine-propeller airliner begins service on British Overseas Airways Commonwealth routes. The Bristol Britannia (top picture) seats up to 92 (a later version will seat 132), travels at 640 kilometers an hour. The British consider it the "transition" transport—between today's big piston engine planes and tomorrow's pure jets.

Meanwhile, in California, Hayden Aircraft Corp. is trying to bring back the famed Ford-Stout trimotor, the "Tin Goose" of the 1920s. Renamed the Stout "Bushmaster," the new trimotor will take off empty in 30 meters, loaded, 180 meters—with a top speed of 232 kilometers an hour. Hayden plans to start production in 1957, hopes Bushmaster will find a market as an economical, short-haul freight-passenger plane for out-of-the-way places.

U.S. Investors Set Records Abroad

The most up-to-date picture of private American investment overseas is presented in the August issue of Survey of Current Business, published by the U. S. Department of Commerce. The main conclusion: U. S. private money is pouring overseas at a faster rate than ever before—and even bigger outlays in the future are in sight.

A record $2,400-million was put into all classes of foreign investments by Americans in 1955. Total is now up to an all-time high of $29,000-million.

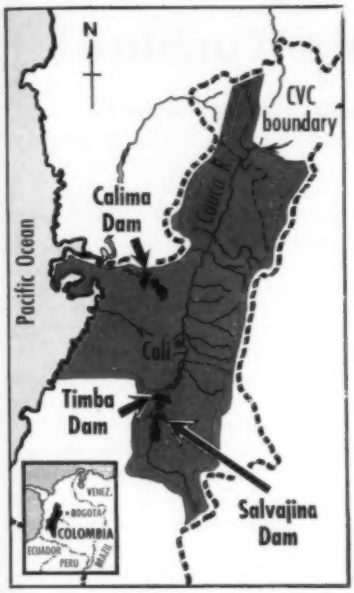
Direct investment in overseas branches and subsidiaries of U. S. companies is the biggest and fastest-growing part of the total. It amounts to $19,200-million, up from $7,000-million at the close of World War II. In 1955, $1,600-million was spent by U. S. firms to open new branch offices and factories overseas. Canada and Latin America each have about $6,500-million and Western Europe $3,000-million of total direct investment. Biggest gains recently—with the exception of Canada—have been in Latin America. More than $300-million went there from the U.S.A. in 1955. About $350-million went to Western Europe, mainly Britain, France, and Germany. Canada continued as the leading area of increase in U.S. direct investment—it received about $600-million.

Information for 1956—indicated in the Commerce Department report, and in the announced plans of American companies—indicates that further big investments are in the development stage now.

Portfolio investments in stocks, bonds and other papers of foreign companies and governments, rose in value $800-million last year. Total value of these holdings is now $9,800-million (see Financial Digest on another page).

Foreign-owned investments in the U.S.A. rose $2,800-million in 1955 to a total of $29,500-million—slightly more than total U.S. investments outside the U.S.A. Most foreign money in the U.S.A. is flowing into bank deposits, portfolio investments, short-term loans. ●

Planning Two Great Projects



CAUCA VALLEY (shaded area) promises to be Colombia's richest area —with 3-million people, good land, water, growing industry.

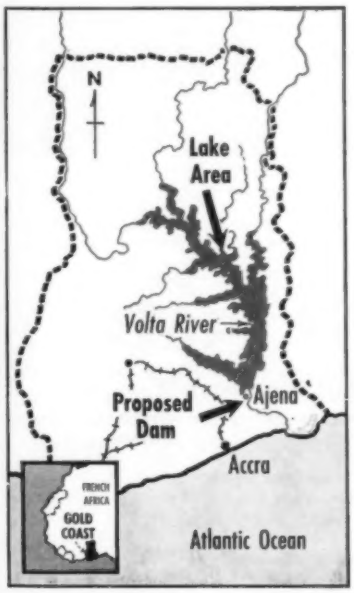
. . . in Colombia

Nature endowed Colombia with tremendous resources. And no part of the nation is more richly endowed than the Cauca Valley (map)—with pleasant climate, good land, rushing waters, and 3-million people. The problem is to develop these resources, as completely and quickly as possible.

The U. S. A.'s Tennessee Valley Authority showed how an area could be developed on an overall, regional basis. Now Colombia is getting started on its own regional development—modelled in many respects after the TVA.

The first big undertaking of Colombia's Corporacion Autonoma del Valle Cauca (CVC) is now under way. It is a 90-meter high dam on the Calima River, to cost around $28.5-million. Power is the Cauca Valley's priority need, to meet demands of expanding industry around the city of Cali. So the Calima Dam is purely for power, and will generate 120,000 kilowatts. Later dams, irrigation and drainage structures, and dredging will carry the program into flood control, land reclamation, improved transport. The largest of the dams is expected to be the Salvajina Dam—151 meters high, for irrigation and power up to 270,000 kilowatts. Projects now planned would cost another $105-million. Future expenditure could reach $500-million.

CVC's major problem is financing. Colombians say they will raise a good proportion of the money at home. They count on foreign credits to supply CVC's capital equipment needs. Today, the World Bank—which helped draft the CVC plan—stands ready to grant some important loans. (Digested from Engineering News Record, Aug. 9, p61).



GOLD COAST project, using Volta River water and nearby bauxite, would be world's largest, and costliest, aluminum venture.

. . . in the Gold Coast

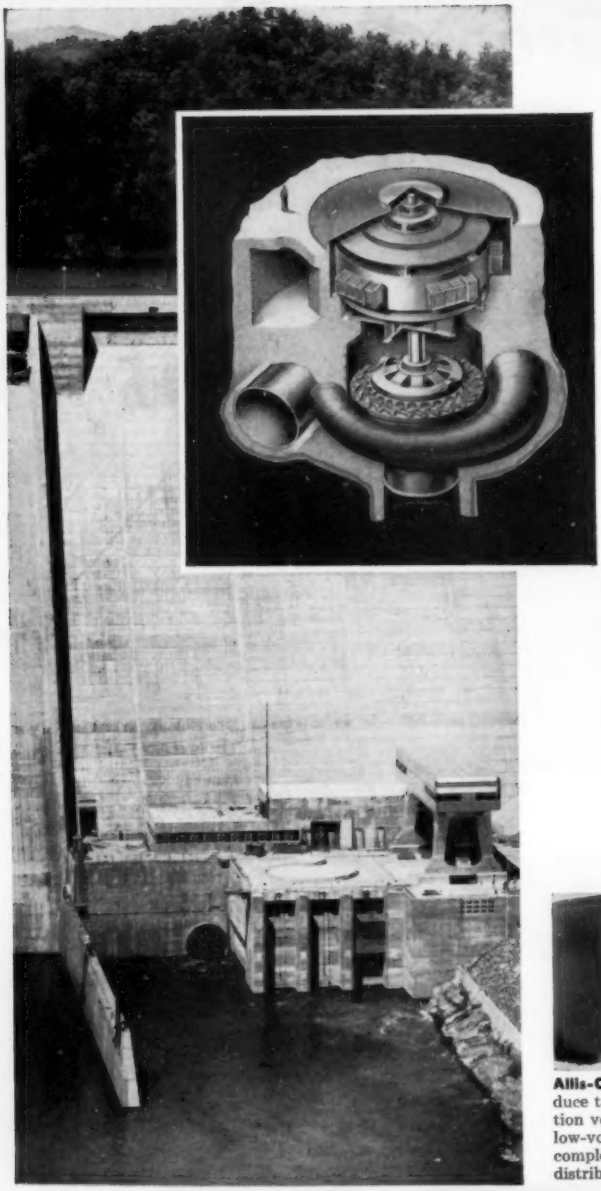
Just as the Gold Coast is moving toward full self government as an independent Commonwealth nation, it must decide whether to go ahead with one of the world's most dramatic development projects. It is a fateful decision for a small, poorly-endowed nation.

The project involves damming the Volta River at Ajena (map), creating a lake 9,100-square kilometers in extent, generating 617,000 kilowatts of power—all at a price to make a major aluminum center economic. Like the TVA and CVC, the project would be operated by a Volta River Authority. It would have four African members, and three European members. The latter three would represent the British government, and the two corporations interested in the scheme—British Aluminium Ltd. and Aluminium Ltd. of Canada.

Another study of the project has just been completed. The plan is reported to be technically sound, and aluminum could be produced at competitive prices.

The problem, once again, is cost. The report estimates the first stage (producing 80,000 tons of aluminum) would cost $455-million. Completed project, 210,000 tons, would cost $803-million.

The Gold Coast share seems beyond the nation's limited financial reserves. Further, the nation depends heavily for its income on the single crop cocoa (much as Colombia depends on coffee)—and cocoa prices are low. Both the aluminum companies and the British government are uncertain about their investment. The World Bank is sending a mission to see if it can help finance the project. (Digested from The Economist, July 28, p323).



World's Largest Reversible Pump-Turbine!

How Allis-Chalmers serves the Electric Power Industry . . . as it serves All Industries!

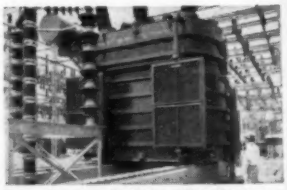
DURING peak demand periods, this huge 120,000-hp turbine generates tremendous amounts of power. When demand drops off, the unit is reversed. Utilizing surplus off-peak power from other plants in the system, it operates as a 102,000-hp pumping unit to restore water to the reservoir for re-use during subsequent peak loads.

Allis-Chalmers pioneered this remarkable development in the hydro-electric field—just as Allis-Chalmers has contributed pioneering spirit, engineering experience and manufacturing ability to the development of steam turbine generating equipment.

You can look to Allis-Chalmers as a single responsible source of basic machinery for all industries—including necessary components to complete your installation.

You can have Allis-Chalmers experience and engineering cooperation applied to your problems—big or little . . . for *any* industry. Just contact your local Allis-Chalmers distributor or write Allis-Chalmers, Industries Group, Export Department, Milwaukee 1, Wisconsin, U. S. A.

Allis-Chalmers Unit Substations reduce transmission voltage to utilization voltage . . . control and protect low-voltage circuits. A-C builds a complete line of indoor and outdoor distribution equipment.



Transformers built by Allis-Chalmers make it economically possible to transmit power long distances. Allis-Chalmers also makes a complete line of power generation and distribution equipment.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

4910G

ALLIS-CHALMERS DISTRIBUTORS LOCATED THROUGHOUT THE WORLD

Products of the Allis-Chalmers Industrial, Electric Power and General Products Divisions are distributed by firms in these cities. Distributors of Tractor Division products also are located in principal cities.

ALASKA—Fairbanks.
ARGENTINA—Buenos Aires.
AUSTRALIA—Sydney.
BELGIAN CONGO—Elisabethville.
BELGIUM—Brussels.
BOLIVIA—La Paz.
BRAZIL—Rio de Janeiro, São Paulo, Recife (Pernambuco), Porto Alegre.
BRITISH BORNEO—Sandakan, Jesselton.
BURMA—Rangoon.
CANADA—Montreal.
CHILE—Santiago.
COLOMBIA—Barranquilla, Bogotá, Medellín, Cali.
COSTA RICA—San José.
CUBA—Havana.
DOMINICAN REPUBLIC—Ciudad Trujillo.
ECUADOR—Quito.
EL SALVADOR—San Salvador.
ENGLAND—London.
FINLAND—Helsinki.
FRANCE—Paris.
GREECE—Athens.
GUADELOUPE—Pointe-à-Pitre.
GUATEMALA—Guatemala City.
HAITI—Port-au-Prince.
HAWAII—Honolulu, Hilo.
HONG KONG—Hong Kong.
ICELAND—Reykjavik.
INDIA—Bombay, Calcutta.
IRAN—Teheran.
IRAQ—Baghdad.
ISRAEL—Tel-Aviv.
ITALY—Milan.
JAMAICA—Kingston.
JAPAN—Osaka, Tokyo.
KENYA—Nairobi.
MALAYA—Kuala Lumpur, Ipoh, Kota Bharu, Penang, Malacca, Seremban, Kuantan.
MEXICO—Guadalajara, Mexico City, Monterrey.
NETHERLANDS—Amsterdam.
NEW ZEALAND—Wellington, Auckland.
NICARAGUA—Managua.
NORWAY—Oslo.
PAKISTAN—Karachi.
PANAMA—Panamá City.
PARAGUAY—Asunción.
PERU—Lima.
PORTUGAL—Lisbon.
PUERTO RICO—Ponce, San Juan.
REPUBLIC OF INDONESIA—Djakarta, Surabaja, Medan, Palembang, Bandoeng, Semarang, Makassar.
REPUBLIC OF THE PHILIPPINES—Bacalod City, Cebú, Manila, Negros Occidental.
SARAWAK—Kuching, Sibu, Miri.
SINGAPORE—Singapore.
SOUTH AFRICA—Johannesburg.
SPAIN—Madrid.
SURINAM—Nieuw-Nickerie, Paramaribo.
SWEDEN—Stockholm.
TAIWAN—(FORMOSA)—Taipei.
TANGANYIKA—Dar es Salaam.
THAILAND—Bangkok.
TRINIDAD—Port of Spain.
TURKEY—Istanbul.
VENEZUELA—Caracas

ALLIS-CHALMERS MANUFACTURING COMPANY, Industries Group, Export Department, Milwaukee 1, Wisconsin, U. S. A. Factories in U. S. A., England and Canada.

Rx

Study your problems—your own diagnosis can help.

Find a well-trained responsible consultant, let him take a detached outsider's view of your company.

Once you decide to go ahead, cooperate with the consultant—and see that your staff does, too.

How to Use the Business "Doctor"

Digested from BUSINESS, July; The ECONOMIST, Aug 11, p509

"They are almost business doctors, are they not" was a question asked in the 1930s about the aspiring profession of the management consultant. In those days, the consultant—more often called an "efficiency expert"—was frequently distrusted, and was usually restricted to simple problems of time-study or accounting.

Today, management consultancy has reached a new estate. It is indeed a profession, and businessmen speak of "our consultants" without an apologetic air. In Britain and the U.S.A., and in certain other nations, management consultants influence the decisions and operations of thousands of companies.

Yet many businessmen know little about the outside consultant. One reason is the idea that consultants are practical only for big companies with big money to spend. This is not true. Nor is the idea that "only inefficient firms use consultants." Most consultants agree that most of their work is aimed at making good firms better, rather than bad firms good.

Finally, management may fear that the consultant "comes into the factory and turns things upside down, and leaves you breathless and penniless." A reputable consultant, and an intelligent management can prevent this.

Employed with discretion, consultancy is a highly useful management tool. The consultant's aim is to put ideas into his clients head. His value consists of bringing a trained eye, and a detached mind, to bear on problems with which everyone on the spot has become far too involved to see objectively. Sometimes the consultant's recommendation is precisely what the company management wants to see done, but it requires an outsider to resolve the conflicts, and put the idea forward. Still more often, the broad lines of what needs to be done are known to management. But the executive time needed to work it out in detail is not available.

Here, from the British management journal *Business* is a useful statement of just how the consultant operates.

I. What They Do

The consultant is an advisor. He does not usurp, even for a short time, the day-to-day responsibilities of his client's executives. Basically, he does three things: (1) identifies the causes of trouble; (2) recommends improvements and new methods; and (3) helps the client put into practice the changes finally approved.

The consultant can apply his skills to nearly any type of industrial or commercial activity. His scope is frequently as broad as the scope of management itself: new product development, personnel administration, purchasing, production methods, finance, and so on down the line.

Indeed, while there are many single specialists—in specific management problems—the larger management consultants today are usually equipped to advise on a whole range of business problems.

The wise company will usually present the consultant with a fairly specific problem—already "diagnosed" by the company management. The lax firm is apt to merely be aware that some sort of trouble exists, and expect the consultant to make an over-all investigation. But there is no absolute rule.

In any case, the consultant seldom accepts his client's own diagnosis at face value, except in obvious cases. This means, in practice, that many consultancy jobs begin with a general survey. It explains why many investigations eventually move outside their original planned boundaries.

Many times an investigation will begin in one department of the business, and arrive in another by what appears to be a rather tortuous route. It is this, probably, that causes some businessmen to think that consultants, like mice, will over-run the place unless precautions are taken.

The consultant's answer is this: He simply points to his growing list of satisfied customers, many of whom use his services regularly. And he claims, with much justification, that his repeat business has come because his clients have learned to more easily recognize wasteful and inefficient methods.

One thing is certain: Where management has made an accurate diagnosis of its problem, the duration of the consultant's job has been cut way down. One big consultancy firm says that where a specific problem is presented, the average job-time is five months. "Full" investigations average 12 months.

II. How They Work

Before he accepts an assignment, the consultant usually visits the client company and makes a

preliminary survey. This takes, generally, from one to five days. The survey is generally free. Management then receives from the consultant a written report that summarizes (1) the problems involved, (2) the probable lines of attack, (3) how long a full investigation will take, (4) estimated cost in terms of capital expenditure, and (5) the savings expected.

On the strength of this report, management must decide whether or not to proceed. Consultants claim that they invariably refuse jobs which, in their opinion, cannot produce reasonably good results. And consultants emphasize that there can be no good results unless top management is nearly unanimous in its determination to cooperate with the consultant.

In some cases, the terms of employment give the client—and the consultant—the right to call off the project at 24 hours' notice; in others, 30 days' notice is required. Throughout the investigation the consultant makes periodic progress-reports to the company.

The idea that consultants "turn things upside down" by putting a team of experts on one job is false. Standard procedure is that one resident consultant does the job from start to finish. His work is supervised by a senior who visits the firm about once a week.

The consultant nearly always asks management to arrange a meeting, at the outset, at which he can discuss his investigation with the department supervisors who will be immediately concerned. He will demand the full and announced support of top management.

If there is a labor union in the plant, he will also want to clarify his position with the union leaders, in advance. It is frequently emphasized to union men that the consultant is not attempting to reduce the staff, or wages. If possible it is shown that the workers' earnings will rise as efficiency is increased and unit production cost is lowered.

III. They Get Results

Case histories show what can be done in firms of various types and sizes:

• **A plastics manufacturer** was having trouble on all sides. After a full survey, consultants recommended changes in organization and the replacement of an inefficient executive. They devised methods of reducing scrap, improving inspection, and speeding material handling. They also helped in streamlining paperwork, and in setting up a separate sales department. Result: sales increased by 130%.

• **A small factory had a serious materials handling problem.** The consultant recommended a new type conveyor, changes in layout, and a revision of the production control system. The job took three months. In the first year, the firm saved £16,000. The conveyor cost £3,000, the layout changes £2,000, and the consultant's fee £1,000.

• **Output per manhour was increased 39%,** employees' earnings 33%, in the cardroom of a cotton mill in which consultants had made a complete "work study." The consultants recommended, among other things, a new floor layout and a new incentive bonus.

• **A company employing between 200 and 300 people** had already been thoroughly "overhauled" by consultants. To play safe, after a few years management had another firm of consultants make a survey. Result: Minor changes were suggested, saving £1,000 a year—more than enough to cover fees.

• **Consultants found that the top managers** of a company each received about 120 pages of financial information every month. The experts reduced this to five pages—with no loss of essential information.

The average cost of consultant surveys in Britain is about £5,000. Despite this, the small concern employing as few as 50 people can often use consultants to great advantage and recover the cost quickly. An expenditure of £200 to £300 will sometimes do the job.

For example, a small concern with 30 employees was losing about £1,000 a year. A consultant was called in. Within six months, the turnover of the business trebled, producing an annual profit of £5,000. Little capital expense was involved. The consultant did his job mainly by reducing the work-content of the firm's product, by revising product design and production methods. The consultant's fee, £3,500, was recovered in less than one year. Obviously, the firm was well pleased with the consultant's work.

The small company can gain much from outside help. This is especially true where the company (1) is run by one or two men whose experience is necessarily limited, (2) is run by owners whose personal relations with the staff are somewhat distant, or (3) is an expanding business that must seek new products and/or new markets. ●

Could a Consultant Help Your Firm?

ENGAGING a management consultant is a delicate business. If a good consultant can make big improvements in an organization, an incompetent consultant can make trouble.

There are thousands of qualified men who justifiably call themselves management or industrial consultants. Most specialize in engineering or accounting problems. Fewer in number, but growing in influence, are the larger, broad-gaged firms equipped to deal with the whole range of management problems.

You can find information about consultants from management groups, trade associations, and universities in your country. You can write to the Association of Consulting Management Engineers (347 Madison Ave., New York 17, N. Y.). Many of its American members are now advising clients throughout the world. And the British Institute of Management (8 Hill Street, London, W1.) maintains a register of reliable and competent consultants, some of whom are active internationally.

Keeping ahead of Mexico's fast-growing, constantly changing business scene, Ramon Cordero of Burroughs studies economics at University of Mexico.

His job is raising the national income

Ramon Cordero is right in the middle of Mexico's booming economy. And his role, working directly with banks, is a critical one.

Cordero started in business with one of Mexico's large irrigation firms. He worked his way up from a water-level job to a drafting office supervisor.

In 1953 Cordero attended the School of Economics at the University of Mexico. At that time he saw great opportunities opening up in the application of machines to business procedure.

"Machinery is making Mexico over," says Cordero. "Our steel, cement and textile mills, our auto assembly and electrical appliance plants, all depend on machinery. But to keep this machinery producing, our business accounting methods must continually improve. Only machines can keep up with machines."

Ramon started with Burroughs 5 years ago. He has received intensive training in machine accounting systems and modern business methods. Now a specialist in banking applications, headquartered in Mexico City, Ramon spends 3 evenings a week at the University of Mexico where he's taking a doctor's degree in economics.

In the last 2 years he has found and helped train several new Burroughs representatives who now also help Mexican businessmen bring their growing enterprises to peak efficiency.

In every country of the free world Burroughs specialists like Ramon Cordero are helping to improve living standards through industrialization—by providing the most modern business methods and machines available. Call *your local* Burroughs man . . . his *experience* can help your business.

Burroughs Corporation, Detroit 32, Michigan, U.S.A.

This engineer (in dark suit) has learned to use electronic brainpower — and get six weeks work done in 30 minutes.

Computers Get Down to Business

Digested from BUSINESS WEEK, July 28, p66

Two years ago Hyman Kalson, senior research and development engineer for Blaw-Knox Co.'s Power Piping Division, Pittsburgh, Pennsylvania (U. S. A.), knew very little about electronic data processing machines. He relied on "hand" calculations to solve problems of pipe flexibility and stress analysis.

Today, Kalson and Blaw-Knox are foresaking the slide-rule and desk calculator for these complex calculations. They have turned to one of the largest electronic "brains"—Remington Rand's Univac. And Kalson is a different man. Not only does he know more about the theories that underlie his work, but he also knows a lot about computing machines, their abilities, their limitations. In addition, he has more time to spend on basic engineering problems.

A few weeks ago, for example, Kalson journeyed from Pittsburgh to the New York Univac Computing Center. His briefcase contained data fresh from the drawing board that mapped out a high-pressure piping system for a large steam power plant.

It took the big computer only 30 minutes to produce data Kalson wanted. It told him what would happen to the pipe network when it started to carry super-heated steam between boiler and turbines.

A year ago, Kalson would have taken his blueprints to a team of stress analysts in his company. Working with slide-rule and calculator, they would have taken at least several weeks—and hundreds of engineering manhours—to make the calculations.

Figuring temperature-pressure and stress relationships is one of the hardest engineering jobs that Blaw-Knox and other power pipe designers have to contend with. The huge arithmetic capacity of electronic computers offers a shortcut to solutions. But that is only true if you have a method to prepare your data for the computer that is not, in itself, more expensive and even slower than hand methods of calculation. Even if the computer can do six weeks' work in 30 minutes, this means little if it takes you eight weeks to develop a "program" to instruct the computer on how to solve the problem. And hiring computer time is expensive in itself.

But if you have many similar problems that come up over and over again, it makes sense to spend time and money on computer programming. At first you consume much time; later on you save it.

Plotting a programming plan occupied Kalson during much of the last 18 months. He immersed himself in a new world that is inhabited largely by a group of eager, young mathematicians. These men are striving to perfect a body of theory and techniques that have already begun to turn computers into powerful tools in the hands of practical engineers.

Kalson, together with a team of mathematician-consultants, has achieved what they consider an important forward step in the field of engineering calculations.

Here is a typical problem: The basic task is to predict what will happen when you heat up a length of pipe. Knowing the expansion-rate of the material, you can easily figure out how much a piece of straight pipe will expand if you heat it to, say, 538°C. But you run into a tangle of complications when the pipe is twisted and has five or six branches, each of which is attached to a structure that will, itself, move when heated. To figure out how much each branch of the piping system moves, and how much stress will cause the movement, is a very difficult mathematical engineering problem. It can take an experienced man several weeks to solve, using a classical type of solution called matrix analysis.

Kalson and his associates figured out that it takes a good electronic computer only a second or two to solve a matrix problem. They reasoned that if a general pattern of

stress analysis could be developed, a solution involving hundreds of matrix calculations could be completed with ease.

The mathematicians converted the problem from the classical solution, which called for only a few tremendously complex equations, to a system that called for many more matrix calculations of a less complex nature. This procedure is typical in computer work where complex problems are often broken down into a great number of relatively simple calculations.

It took over a year to get the equations programed and tested. But once completed, the entire computer program—involving several thousand steps—was stored on a 460-meter roll of magnetic tape, to be used over and over again.

Operation of the machine is "like a miracle," Kalson says. The first few minutes of computer operation—after the coded tape is inserted in the machine—are marked by a flurry of activity. The computer quickly digests and memorizes its program. Then it begins to accept the problem. First it checks the geometry of the piping system. It adds up each length of straight and curved pipe, pinpoints junctions and anchors, considers the radius and angle of each curve, testing it for tangency with pipes associated with it. The computer—according to the program instruction—will signal any error simply by stopping.

Once the data is checked for consistency, the computer settles down to work on the series of calculations. In case of any sort of breakdown in the thousands of circuits of the computer, a loudspeaker blares out, red lights flash on, and the computer stops.

Computer-minded engineers, like Kalson of Blaw-Knox, are finding themselves turning more and more toward the fields of higher applied mathematics. To use the big computers, they know now that they must go way beyond the usual range of engineering theory and practice. ●

Several computer "service centers," like the one engineer Kalson visited, are now established in Europe and Latin America by Remington Rand and International Business Machines Corp. of the U.S.A., and by British companies. See MANAGEMENT DIGEST, April, p14.

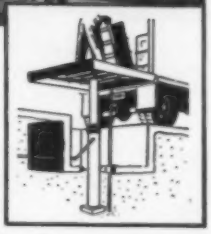
THREE WAYS TO SPEED TRUCK LOADING

"Lift-Portation" expedites materials handling . . . cuts costs

By Argus Leidy, *Vice President in charge of Export*

No matter how snugly a truck is backed up to your loading dock, there is still a gap and a height variation between the truck bed and the dock. The operation of passing goods across this gap is costly, time-consuming, and can be dangerous.

You can bridge this gap by one of three modern mechanical loading devices manufactured by Globe Hoist Company. Each of these devices is easily installed . . . will pay for itself quickly by speeding the movement of goods in and out of your business establishment.



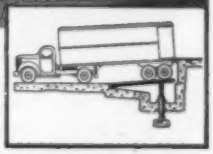
Designed to eliminate ramps, gangplanks, and manual lifting, Globe Platform Lifts permit fork trucks or hand trucks to be run on the platform at ground level and, after being raised by smooth hydraulic power, to run into the truck.

Globe Platform Lifts are low-cost and designed to fit most needs. Lifting capacities range from 5,000 to 80,000 lbs. Platform raises 58"; controlled either by air-oil unit or Globe Oil Pump.

All too often the "standard" height above road level of shipping docks is either too high or too low for most truck bodies. Because of slow loading and unloading, trucks wait for platform space . . . costly delays result for shipper and receiver.

Installation of a Globe Trans-O-Matic Ramp provides smooth travel regardless of difference between truck bed and platform. Fast pushbutton control brings dock level to truck level. The Ramp's steel lip moves 15" up or down . . . floats with either rising or lowering action of truck or trailer floor. And you can handle two or three times more freight on your present dock area.

Ramp sustains rollover weight of 20,000 lbs., storage loads up to 400 lbs. per sq. ft.



Where it is more practical to position the truck or trailer, Globe Truck Levelers are used to raise or lower bodies so that beds are flush with platform.

The unit consists of a sturdy hinged ramp powered by two hydraulic rams. A Globe Electric Oil Pump supplies the power. Size is 10 x 12 feet . . . lifting capacity is 40,000 lbs.

GLOBE®
PLATFORM LIFTS
PLANTS: DES MOINES—PHILADELPHIA
LONG BEACH, CAL.

GLOBE HOIST COMPANY, Export Department MD-743-MH
1000 East Mermaid Lane, Philadelphia 18, Penna., U.S.A.

Cable Address "Globehoist"

Please send us complete information on Globe Trans-O-Matic Ramps, Globe Platform Lifts, and Globe Truck Levelers.

NAME .....

COMPANY .....

ADDRESS .....

CITY ..... COUNTRY .....

Thinking Ahead in Management

A Realistic Measure of Efficiency

Digested from HARVARD BUSINESS REVIEW, July-Aug, p105

IT IS DANGEROUS for the management of a production plant to rely on any one single index of efficiency. It is especially dangerous when the index relied on is nothing more than a measurement of two factors: volume of output and manhours-per-unit of production.

The efficiency "controls" that cause the most trouble—and give the least complete picture of what really goes on in a plant—are those based on the shaky concept that the efficiency of an operator or department can be determined by comparing (1) the time spent to complete an item with (2) a predetermined "standard" time. This is nothing more than the formal "time study" that became a great vogue in industry during the 1920s and 1930s.

To rely too heavily on such controls can lead to many problems: waste of executive time, increased costs, low morale, impaired quality, irregular output, and friction between individuals and departments. True, in recent years many companies have wisely broadened their control standards to include such factors as quality, tool cost, inventory levels, and production schedules. However, most factory managers still cling to the idea that production-time provides the best and most decisive way to measure efficiency.

Trouble is caused by a perfectly natural human reaction to time standards. People who are forced to observe just two variables—pieces produced and man-hours expended—soon acquire a pattern of behavior that has but one objective: to make their scores look good.

Consider the case of a large company whose efficiency ratings were based solely on "time values" and the units of finished goods transferred from the production floor to the shipping room. In this company, the plant manager accepted the efficiency figures as the complete measure of each department's accomplishment.

When efficiency as measured by this index dropped, top supervisors rushed to find out why, and lower supervisors employed their wits in preparing iron-clad excuses. For example, one supervisor compiled figures to "prove" that certain departments with low ratings were really not as inefficient as they appeared.

"I have a report on all parts undergoing inspection on the last day of the month," he would explain. "If you add those to the total, the low departments are not as low as they may appear on paper."

Even where subordinate supervisors could offer what appeared to be legitimate excuses, company executives devoted much time to looking for additional explanations. One foreman described this experience:

"Once we ran out of forgings for one of the two parts I make, and so we ran the other part. Then we got the late forgings in, and they wanted them done in a hurry. I had to put the parts I had been working on aside and set up the new job. The end of the month, my efficiency dropped 20 points.

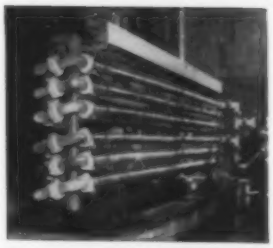
"Then management came down here fast. They spent a month investigating. The point was, I had the original parts which I had been working on lying on the floor—partly done. I could have finished them easily by the end of the month and got a 90% or 92% efficiency. But with the changeover, I had to leave them unfinished."

In this company, as in many others, the great emphasis placed on time-output ratings caused production jams, high costs, low morale, and a serious amount of "covering up." Department supervisors even resorted to such costly pretenses as "bleeding the line"—that is, stopping the production cycle and shifting labor to final operations in order to complete more units by the deadline.

A more subtle bad result of this quest for high time-output ratings was "manpower fudging" by top supervisors. Some of these men, anxious to equalize ratings among departments in their charge, would transfer personnel "on paper" from departments with low ratings to departments with high ratings. This tended to protect weak departments, but penalized successful departments. Result: extremely low morale among department foremen.

A broader approach to efficiency evaluation is needed. Fixed, rigid standards have a place—they are one major indication of performance. But they need to be supplemented by other indexes of efficiency. Human factors, morale factors, plus innumerable unknowns are unrevealed by a purely mathematical approach.

Above all, management needs to develop non-accounting sources of information. Executives should place less reliance on figures, and more on personal observation and on what can be learned from man-to-man discussion with lower-ranking supervisors and foremen.



Scale deposits which impede heat flow do not form on the hard, smooth inside surface of the CORNING pipe in this heat exchanger.

CORNING brand sight glasses provide visibility plus heat and chemical resistance.

This pipe would last **203** *years on a diet of hot hydrochloric acid*

Handling corrosive fluids may be forcing you to pay more than your share of industry's multi-billion dollar annual bill for the perpetual war against rust.

CORNING brand "Double-Tough" glass pipe can help you cut your corrosion losses.

This pipe carrying 5% hydrochloric acid at 212° F. loses only .0003 inch of its thickness in a year. At that rate it would take over 200 years to eat away 30% of the wall thickness. It would take over 600 years to eat completely through the pipe.

CORNING pipe not only resists eating away by hard-to-handle fluids. It's also easy to flush clean. Even sticky substances and organisms won't adhere to its hard, smooth surface. Its transparency is often important, too. You can see what's going on inside—spot trouble in the making.

You don't have to worry about breakage. CORNING pipe is called "Double-Tough" because all fittings and flanged ends are tempered. This makes them 2½ to 3 times stronger than ordinary glass.

CORNING pipe is only one example of how glass by CORNING is aiding industry. If your problem is corrosion—or cleanliness, heat resistance, light transmission, visibility or better looks for your product—consider glass by CORNING.

Why not write today and see how glass can help you either as piping or for some other application?

FREE BOOKLETS: Send the coupon or write for copies.

This 16-page booklet, "CORNING brand 'Double-Tough' Glass Pipe in the Process Industries," illustrates the experience of many users.

This new 48-page booklet, "Glass and You," will bring what you know about glass up to date. It may spark a new product or a new production idea.

CORNING GLASS WORKS

International Division
Export Sales Department 10-B
718 Fifth Avenue
New York 19, N. Y., U.S.A.

Corning means research in Glass.

CORNING GLASS WORKS • INTERNATIONAL DIVISION
Export Sales Dpt. 10-B, 718 Fifth Avenue, New York 19, N. Y., U.S.A.

Please send me a copy of "Glass and You" ☐ and a copy of "CORNING brand 'Double-Tough' Glass Pipe in the Process Industries." ☐

Name_____

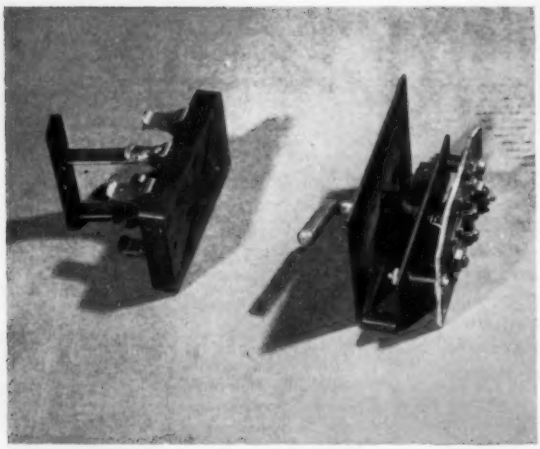
Company_____

Address_____

City_____ Country_____

When methods engineers (above) meet, and study each product part by part, they often find savings in materials costs like these

1 ALUMINUM substitutes for copper in choke coil, held by C. M. Erickson, head of methods department at Lincoln Electric Co.'s machine division. Overall savings in manufacturing costs: about 38%.



4 THINNER LAMINATE replaces heavier base in new reversing switch (right). It's a thin glass-base laminate, instead of a paper-base phenolic. Saving: 42%.

5 TUBING replaces bar stock. Seamless steel tubing, with plastic taking up excess space (right), substitutes for machined cold-rolled bar stock. Saving: 25 cents.

Materials: Prime Target for Cos

Digested from FACTORY MANAGEMENT & MAINTENANCE, Aug, p93

Using new materials, and finding new ways to use old materials, together offer management one of its most promising opportunities to reduce costs. This is true in almost every industry. As mechanization advances, as labor seeks higher wages, materials become the prime target for cost-cutting.

The pictures above show some results of a systematic approach to materials use—at Lincoln Electric Co. (Cleveland, Ohio, U.S.A.). For the year 1956, Lincoln expects a 10% saving on overall manufacturing cost from its material conservation program alone.

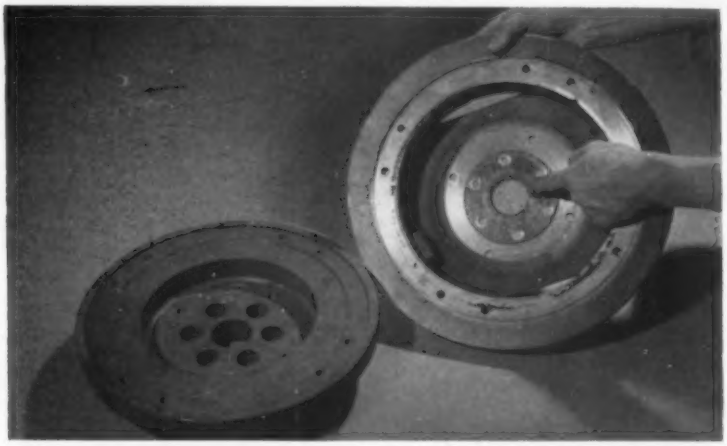
Such a program requires: (1) a methods department with trained engineers; (2) a high degree of teamwork in all departments; and (3) a healthy attitude toward changes within the company.

At Lincoln, the "methods men" are getting deeper into product design; they build their own prototypes, run tests on new materials and methods in cooperation with all other departments. That their work is successful is proved by the fact that more than half the 35 to 40 engineering changes made every week in Lincoln's machine division

2 POST AND STAMPING substitutes for a casting. Cadmium-plated steel post and copper stamping (right) replace a bronze-casting in brush holder. Analysis showed fabricated design saves 71 cents per unit.

3 CARDBOARD for paper. Wax-lined box replaces paper winding on coiled electrode. Saving—10%.

6 CARDBOARD for tin can. Electrodes are now packed in cardboard carriers. Savings: 40%.



7 STEEL substitutes for cast iron. This welded steel flywheel (right), made in Lincoln Electric's own plant, replaces the old-style cast iron flywheel provided by contractor. The saving: about 46½% on each flywheel.

Reduction

originate in the methods department. And many new products reach the market in weeks or months—instead of years.

The meeting (picture, upper left, page 28) is an important part of the process. For example: Twice a month, the methods engineers meet to analyze, piece by piece, every welder manufactured by the company. The machine is dismantled at the meeting, and the group sets about producing new ideas. It may take several meetings to go over every part. But by the time the group is finished, there may be 40 to 80 new cost-cutting ideas.

After the key question—"Can we make it better and cheaper?"—the "idea pattern" may go like this:

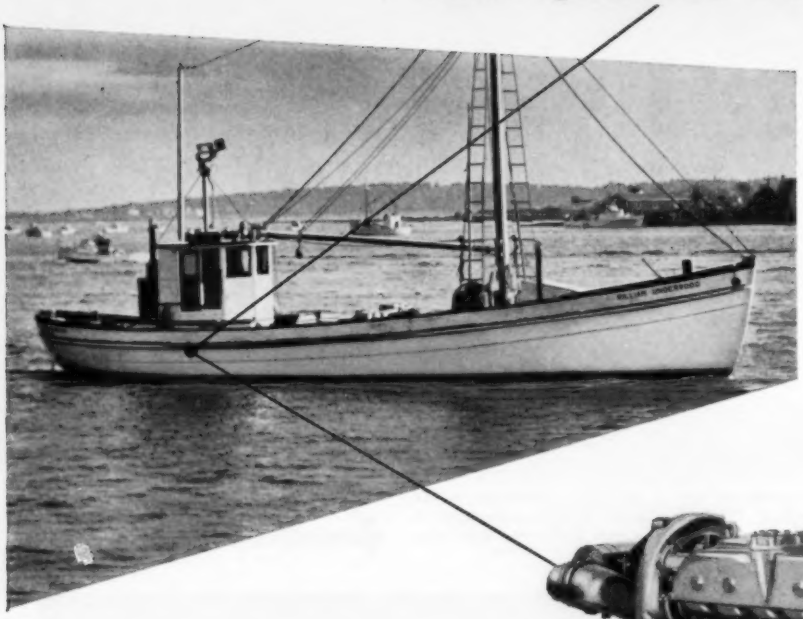
Can we use a cheaper material? A new material? A familiar one?

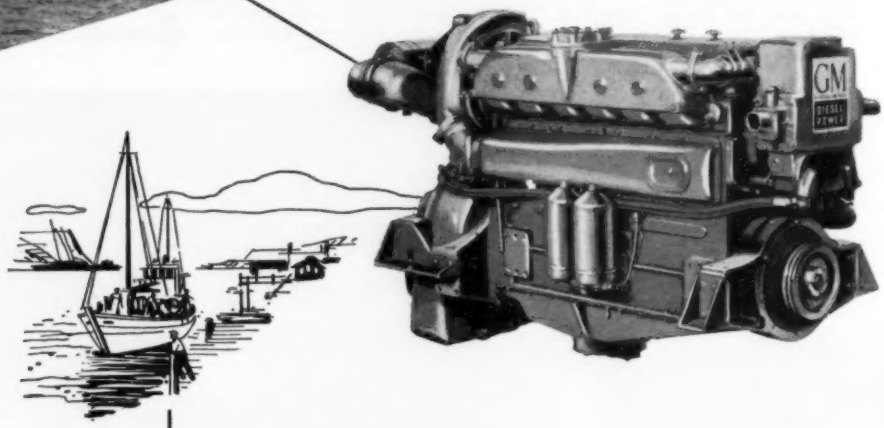
Can we use less material? Trim off excess? Make other parts from corners or centers? Can we change parts to reduce scrap? Can we reduce thickness? Width? Can we come out better with a new material, even if it costs more at first?

Can we cut costs with this same material we are using? Make the part cheaper by eliminating an operation? Process it differently?

Lincoln's methods teams have wide experience; all members come up through company ranks. New members are usually young engineers with a year's experience in the plant. By the time they reach the methods team, they are fully indoctrinated in the company policy of efficiency above all, and the constant necessity for change. ●

The power of economy





GM Diesels are preferred by experienced boat owners—for boats of all kinds and sizes. They make maneuvering easier, respond readily to simplified controls, and vibrate less. Since they don't rely on spark ignition, GM Diesels perform dependably even in bad weather. Most remarkable of all, though, is their economy!

Lower Operating Cost. From one-third to one-half lower operating costs because Diesels use far less fuel per hour . . . and Diesel fuel usually costs less than gasoline. Simpler engine design and rugged construction assure more trouble-free hours of service between overhauls.

Longer Cruising Range. In Diesel's more inherent efficiency, lower fuel consumption, higher compression ratios and more BTU's converted to power per gallon of fuel . . . you have a combination that really boosts your cruising range. Greater speed also cuts running time . . . permits longer trips per day.

Greater Safety. Diesel fuel practically eliminates the fire and explosion hazards of highly volatile gasoline. Toxic carbon monoxide fumes are also almost completely eliminated with Diesel engines. Such safety features are mighty important to workboat crews who often spend days aboard ship with engines running constantly.

Increased Dependability. Wherever dependable operation is important you can depend on GM Diesel. Simple and rugged construction are part of the reason. The Diesel principle, with no electrical ignition system, eliminates trouble caused by dampness. You get safe, sure, quick starts anytime . . . everytime with GM Diesel.

General Motors Overseas Operations
DIVISION OF GENERAL MOTORS CORPORATION

1775 BROADWAY, NEW YORK 19, N. Y., U. S. A.

GM GENERAL MOTORS DIESEL POWER

FOR ADDITIONAL DETAILS, CONTACT THE GMOO REPRESENTATIVE NEAREST YOU.

ARGENTINA, Buenos Aires
AUSTRALIA, Melbourne
BELGIUM, Antwerp
BRAZIL, São Paulo
DENMARK, Copenhagen N.
EGYPT, Alexandria
ENGLAND, London, S.W. 1
FRANCE, Paris
GERMANY, Russelsheim/Main
MEXICO, Mexico, D.F.
NEW ZEALAND, Wellington
PAKISTAN, Karachi
PERU, Lima
PORTUGAL, Lisbon
SOUTH AFRICA, Port Elizabeth
SPAIN, Barcelona
SWEDEN, Stockholm 20
SWITZERLAND, Bienne
URUGUAY, Montevideo
VENEZUELA, Caracas

GENERAL MOTORS LOCOMOTIVES

World Management at Work

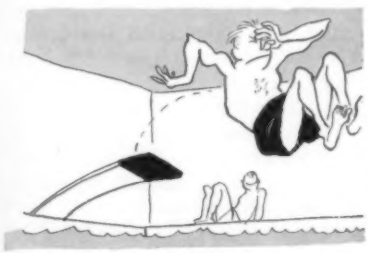
European ideas for U. S. firms . . . Swimming in Sweden . . . Training twist . . . British scholarships abroad . . .

TO INFORM U. S. industry on European technical developments, the Armour Research Foundation of the Illinois Institute of Technology, Chicago, has set up the "European Technological Observation Group Plan." Eighteen American companies are participating thus far. The service is being offered to other firms interested in ideas and techniques of potential value in the American market. Headquarters: the Netherlands.

A staff of five field engineers will serve as observers in Europe—covering mechanical, electrical and chemical engineering, metallurgy, and chemical production.

Armour says the observers will not engage in "surreptitious activity," but will transmit only freely available information (*Product Engineering*, Aug, p212).

●



A SWIMMING POOL for employees has been installed by Pentaverken, maker of automobile motors and gearboxes, Skovde, Sweden. Fire inspectors told the company to build a reserve water tank. So Pentaverken built it in the form of a small, handsomely tiled, indoor swimming pool—16 x 5½ meters. Workers use it in their off hours (*Factory Management & Maintenance*, Aug, p122).

●

MANAGER'S TRAINING is high on the business agenda these days. It is also high on the list of things that create awkward personnel problems. For instance, how can you select a few individuals for foreman or supervisor training without damaging morale? Almost invariably, when trainees are selected from a group, two or three men are seriously offended because of being "left behind."

Cities Service Refining Corp., Lake Charles, Louisiana (U.S.A.), decided on a simple solution. Train them all—that is, all the people who would normally be considered for training. Cities Service says "Not only does this answer our question on morale, but it solves our problem of selecting trainees, too. If all possible candidates are given an equal chance in the same class, we can make a better final choice for each promotion than if we selected one man for training. And nobody can be offended" (*Personnel*, July, p19).

●

OVERSEAS SCHOLARSHIPS sponsored by the Federation of British Industries have been awarded liberally in the past year. In a recent three-month period, 107 training scholarships were awarded to engineers from 19 different countries. A further 118 are now on offer. The foreign engineer is transported to Britain, and is given practical training in British factories. The idea is to benefit the engineers—and, of course, to increase familiarity with British methods and products. (*Metalworking Production*, Aug, p1223).

●

A NEW PLANT was being proudly displayed to visitors by the company president. "We are completely automated," said he. At the end of a long automatic assembly line was a large, square black box; finished, but not yet packaged, products moved into it on a conveyor belt. After a moment the products slid out the other side, completely packaged.

Inside the black box, stooped in a small space and quite hidden, were four men busily stuffing the product into cartons. The company had not yet gotten around to "automating" the packaging line. (*American Machinist*, July 30, p125).

A HIGH PRODUCER
in confined areas

TRACTOMOTIVE TL-6 TRACTO-LOADER is ideal for handling bulk material in factories. Travels through narrow aisles and doorways and makes sharp turns near columns and posts. It has a short, 1.98m (6½-ft) turning radius. The over-all length is only 2.92m (9 ft, 7 in.); width, 1.34m (4 ft, 5 in.). Bucket capacity is 0.38m³ (½ cu yd).

The TL-6 has the same outstanding features common to all models of Tracto-Loaders.

A HYDRAULIC TORQUE CONVERTER DRIVE makes loading smooth and fast, without engine stalling.

A CLUTCH-TYPE TRANSMISSION practically eliminates gear shifting. The operator just pulls or pushes a lever to go forward or reverse.

A TIP-BACK BUCKET gets and delivers FULL loads. It has a scooping action and carries loads in a level position, just above floor. This means easier maneuvering, greater stability, better visibility.

Ask your ALLIS-CHALMERS CONSTRUCTION MACHINERY DEALER to show you the TL-6 or the three larger Tracto-Loaders in action. Send for free catalog.

TRACTOMOTIVE
TRACTOMOTIVE CORPORATION
Export Dept. MD, Deerfield, Ill., U.S.A.

What Can Men and Machines Do?

NEW APPROACH to quality control promises still higher product quality and lower cost.

KNOW CAPABILITY of your men and machines. That's the heart of the new approach.

HERE'S HOW you can put capability studies to work in your quality-control program.

Digested from AMERICAN MACHINIST, July 30, p101

Quality control aims at making a satisfactory product at least cost. Essentially this is what happens in most plants: When test-sample parts do not meet assigned tolerances, the operator shuts down the machine until it is adjusted by a mechanic. But is this the most effective and cheapest way of controlling a product's quality?

York Corp. (York, Pennsylvania, U.S.A.), manufacturers of refrigeration equipment, uses a somewhat different approach to the problem of quality control. It is based on machine-capability studies, and seeks to find the answers to:

- What can a man do?
- What can a machine do?
- What can the combination of man and machine consistently produce?

These are three fundamental questions in every phase of manufacturing activity. For example: If a new product is to be produced, the question is the procurement of machines that will, when operated by competent men, produce acceptable parts. With a going operation, the question is the day-in, day-out production of acceptable parts. When changes are made in parts or processes, the problem is to find the capability of the machines and operators required to produce the revised parts.

Then you have the problem of the compatibility of engineering specifications and the capability of available equipment. And you will have to consider the economic balance between the engineer's optimum requirement, and the practical execution of the requirement in production.

Still another factor is the capability of your supplier's processes. The supplier whose machine capability is well within your tolerances will consistently send you good material. If a supplier's process is barely capable of staying within your specifications, your risk of receiving defective material is much greater.

Your own machine and man capabilities are vital factors in determining the quality level of the product you send to your customers. No inspection or quality-control system can substitute for a manufacturing process that is wholly capable of meeting the specification without extreme policing or inspection.

Probably the biggest value of capability studies is the trend of thinking generated in the design engineers as they become aware of machine and man capabilities. Several tools remind the engineer of what can be done.

A basic tool is a manual of standard tolerances for a given company. Even in a company with both job shops and high-production shops, each using different production techniques, it is possible to develop a book containing the general capability of the various processes in a company. It should describe what each class of machine can do, and in some cases even deal with individual machines.

The product engineer must work closely with the industrial engineer; he must know what processing techniques the industrial engineer plans to use. With this knowledge, the product engineer can refer to his manual of standard tolerances and in most cases use tolerances that are compatible with existing equipment.

Suppose you have a new product or process. Here the product engineer uses his best techniques and historical data to design the product. Then he approaches the industrial engineer who is setting up the job to find out if the design tolerances are practical.

If a new machine, radically different from any other machine the company owns is to be used, you have to obtain capability data from users of similar machines. Or you can have the tool supplier provide the data from previous machines he has manufactured.

Setting up a general tolerance manual and instructing engineers in how to use it is a long-range project. York Corp. gathered all available commercial and government publications on the variations of standard metal-fabricating processes and techniques. At the same time, every production foreman was solicited for his opinion and asked what the capability of his equipment was with a competent operator.

These recommendations were then compiled into a rough draft, and submitted to the product engineering and industrial engineering departments for their study. Industrial engineers looked at them—from the standpoint of their knowledge of what the machines they have should be able to do. The product engineers each looked at them—from their particular product standpoint. In effect, product people wanted to know this: whether tolerances recommended for the machines generally used on their products were compatible with the degree of accuracy they wanted for their equipment.

After many meetings among these various departments, basic agreements were reached, and by internal sifting of the informa-

(Continued on p34)

How to Make a Machine-Capability Study

FIVE STEPS tell supervisors and engineers the meaning of a capability study:

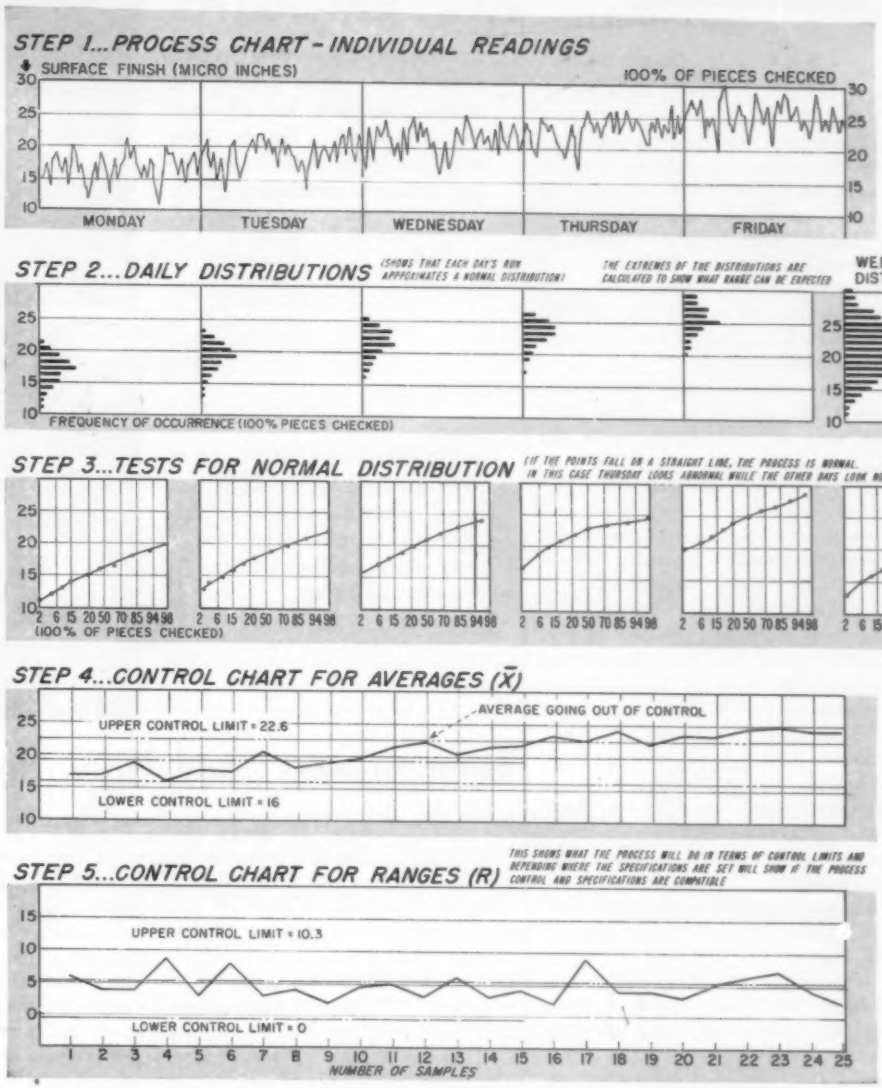
1. **Surface-finish readings** on individual pieces are plotted for a week to develop the deterioration of surface quality with time. Depending on product specifications, this chart will show the need for tolerances.

2. **Daily distributions** show that each day's run approximates a normal frequency distribution. They also show what range can be expected daily.

3. **Tests for normal distribution are** made with arithmetic probability scales to see if the points fall on a straight line. Production was normal on all days except Thursday.

4. **Control chart for average** indicates loss of control at the 12th sample.

5. **Control chart for ranges** indicates what the studied process will do in terms of control limits. Depending on where the specifications are set, the chart shows if the process control and the specifications are compatible.

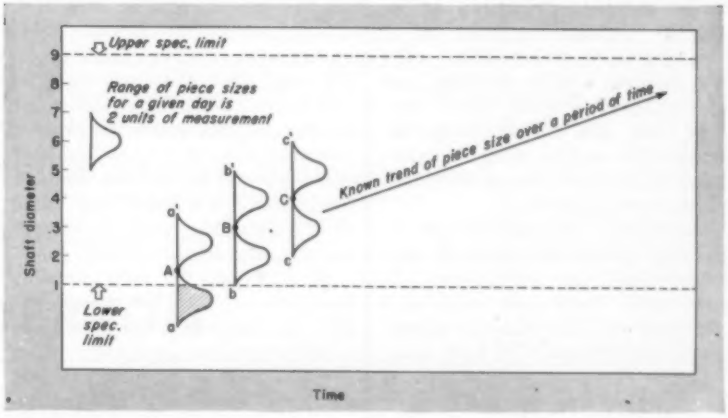

STEP 1...PROCESS CHART - INDIVIDUAL READINGS
SURFACE FINISH (MICRO INCHES)
100% OF PIECES CHECKED
MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
STEP 2...DAILY DISTRIBUTIONS
(SHOWS THAT EACH DAY'S RUN APPROXIMATES A NORMAL DISTRIBUTION)
THE EXTREMES OF THE DISTRIBUTIONS ARE CALCULATED TO SHOW WHAT RANGE CAN BE EXPECTED
WEEKLY DISTRIBUTION
FREQUENCY OF OCCURRENCE (100% PIECES CHECKED)
STEP 3...TESTS FOR NORMAL DISTRIBUTION
(IF THE POINTS FALL ON A STRAIGHT LINE, THE PROCESS IS NORMAL. IN THIS CASE THURSDAY LOOKS ABNORMAL WHILE THE OTHER DAYS LOOK NORMAL)
WEEKLY
(100% OF PIECES CHECKED)
STEP 4...CONTROL CHART FOR AVERAGES (X̄)
AVERAGE GOING OUT OF CONTROL
UPPER CONTROL LIMIT = 22.6
LOWER CONTROL LIMIT = 16
STEP 5...CONTROL CHART FOR RANGES (R)
THIS SHOWS WHAT THE PROCESS WILL DO IN TERMS OF CONTROL LIMITS AND DEPENDING WHERE THE SPECIFICATIONS ARE SET WILL SHOW IF THE PROCESS CONTROL AND SPECIFICATIONS ARE COMPATIBLE
UPPER CONTROL LIMIT = 10.3
LOWER CONTROL LIMIT = 0
NUMBER OF SAMPLES

SETTING UP the machine is facilitated by knowing machine capability and trend of piece size over a period of time. Mechanic knows that range of piece sizes for a day is 2 units. Knowing trend he tries to set up as close to the lower limit as possible. So:

1. **He makes a single piece A** in his first try. This can be at the bottom or top of the distribution of pieces that will be produced that day. Remaining pieces can fall anywhere from a to a' hence some will be out of tolerance.

2. **He resets machine,** makes piece **B,** but barely gets the distribution inside limits.

3. **He resets again** and produces piece **C.** This setup meets specifications.


Upper spec. limit
Range of piece sizes for a given day is 2 units of measurement
Known trend of piece size over a period of time
Shaft diameter
Lower spec. limit
Time

"Engineers now know where they influence cost, quality, customer satisfaction . . ."

(Begins on p32)

tion, tentative values were established for the tolerances. Where acceptable tolerances could not be determined, capability studies were made immediately. (For an actual capability study see p33.)

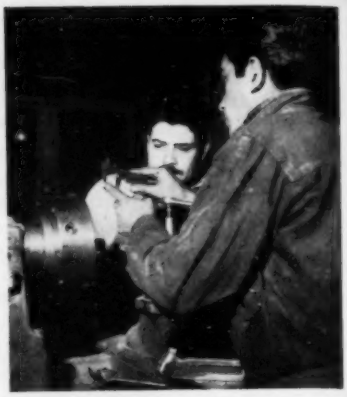
Many side benefits appeared during the studies. Out-of-control conditions were indicated; improper relationship of existing tolerances to machine capability was a frequent finding.

Now when products are developed, the engineers proceed step by step in conjunction with the industrial engineering and the quality-control departments. The cases where their requirements are totally incompatible with existing equipment are rare. Where they are, York's industrial engineering department has enough advance warning to design or purchase equipment that will do the job, or the engineer has a chance to turn in another direction.

York also found that, in many places, engineering practice had dictated tolerances much more stringent than actually required. And, in some cases, the shop process was actually more precise than the engineers had specified. That increased precision could be used in future design to a decided advantage.

Operators gained a greater confidence in their ability. They quickly learned that they were not being asked to perform a task beyond the combined man and machine abilities. It became easier for the operators to point out to the engineers where they could not operate within drawing and specifications studies. They realized that any action would be based on a careful study to determine if the fault lay in man, machine, or specifications.

All-in-all, York feels that its capability studies have paid off. Engineers are now more aware of how much their own individual decisions on tolerances or dimensions can influence the cost, quality, and customer satisfaction of the company's products. ●



MAINTENANCE WORKERS who know their job are a prime requisite for efficient management. Here, two men perform a task requiring extreme precision.

MAINTENANCE PROGRAM tells workers what machines need what attention. It can prevent breakdowns; or if they occur, hold downtime to a bare minimum.

Maintenance: Good Now, Better Later

Digested from INGENIERIA INTERNACIONAL INDUSTRIA, Sept, p46

A good maintenance program keeps Acabados de Mexico, S.A., (textile finishing) producing under difficult circumstances. "Much of our work is done in a continuous process," says Acabados plant manager. "We have in many cases only one machine for a specific part of the process. That is especially true of the big machines. If we had two or more of each kind of machine, we could install some system of preventive maintenance. We could shut down one machine and inspect it while the other one carried on. But under the present circumstances if we have to shut down a machine, we lose valuable production. We know the value of maintenance, and preventive maintenance is our ultimate goal."

A staff of 31 men handles maintenance for Acabados—just 10% of a force of 334 people. Here is the company's program:

• **Two men** do nothing else but lubricate machinery and equipment according to a set schedule. Each machine is diagrammed to show where and what kinds of lubrication to use. Lubrication records are kept.

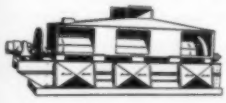
• **A card history** for each machine shows past repairs and spare parts required.

• **When a machine breaks down,** a work order is sent to the maintenance department, outlining the job to be done. Also, the worker assigned fills in starting and finishing times and work done.

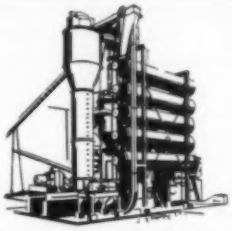
Major repair work is done on Sunday, when the plant is closed. Meanwhile temporary repairs are usually made on the machine to keep production going.

As Acabados adds new equipment, it expects to enlarge its maintenance staff and expand its program—to the point where it can take equipment out of production and make the necessary repairs and adjustments on a regular schedule. ●

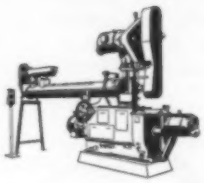
For the BEST INFORMATION on all Oil Milling Equipment...



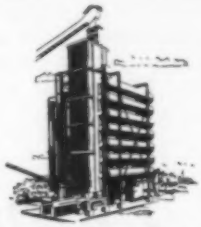
Cake and Meal Cooler—Grain Dryer



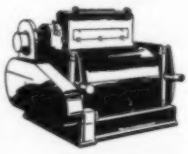
Total Emersion Type Solvent Unit



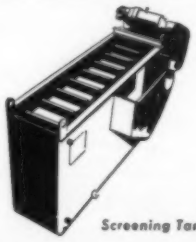
Heavy Duty High Capacity Expeller*



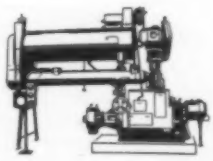
Basket Type Solvent Unit



Flaking Mill



Screening Tank



Grain Expander

Disolex*

See Anderson First

● When you need sound advice and information on oil milling equipment, you'll do best to consult Anderson. Anderson has pioneered and patented most of the oil extraction developments in use today. Their equipment, as a result, has the reputation among the industry of being the most efficient money can buy. Write today for complete details on any requirement, large or small.

The V. D. ANDERSON COMPANY • *Division of International Basic Economy Corporation*
1962 WEST 96th Street • CLEVELAND 2, OHIO, U. S. A.

*Trademarks Registered in U. S. Pat. Off. & Foreign Countries

ANDERSON

World's Largest Supplier of Extraction Equipment

Dutiful

SQUIRE

Beautiful

ESTATE CAR MOTORING AT ITS BEST

HERE'S ALL THE SPACE you need for work-a-day needs . . . 41·5 cubic feet of it, *and* spacious comfort for two passengers. Or, with the rear seats in position—all the style and elegance of a craftsmen-built saloon with room for four. Take your choice of the sturdy Escort or the sleek Squire. Either way you'll be proud to own an Estate Car that's built to suit your every need—work *and* play.

ESCORT

... and World-Wide service too !

PRODUCTS OF FORD ENGLAND MOTOR COMPANY LTD

Five degrees of automation, four of them common today, measure how much automation your machines possess.

Now—A Way to Measure Automation

Digested from AMERICAN MACHINIST, Aug 13, p149

Few people have really tried to apply a measuring stick to automation. There are troubles enough trying to define it. Now, two Detroit consultants, George and Paul Amber, have devised a system which breaks down automation into five degrees.

As a start in developing a scale for "measuring" automation, they determined the "least common denominator," the basic indispensable factors of any job. Only two such basic factors appeared. These are energy and information.

• **Energy** to do a job can be provided by either a man or a machine. In either case, there is only one grade of energy. It is either available, or it is not available.

• **Information,** what job is to be done, and how to do it, can also be provided by either man or machine. But there are many grades of information that can control energy to do a job. Classifying automation consists mainly of classifying the types of information that a machine uses.

I Simple Automation

The simplest devices that replace modern man's efforts are the power tools. These provide most of the energy requirement, leaving man much less energy to provide. Man must mainly control the power tool and feed work to it. This means that some work must be done by the man.

But, the fact that one of man's faculties, that of providing energy to do the basic job, has been assigned to a machine, does give the machine a quality of automaticity. The familiar hand-drill, power saw, jack hammer, and cutting torch, are in the class of tools having the first order of automaticity. This is so because they replace a human faculty, the energy to do the basic job. The Ambers' call this the first order of automaticity, A_1.

The class of power tools that also possess power feed, such as radial drills, cutoff saws, and bench lathes, have the second order of automaticity, A_2. These machines provide all of the necessary energy, for any given operation. But control is still the job of the operator.

Once we have power drive and power feed, the next logical step is to have the machine "control" itself. Machines that control their operations have the third order of automaticity, A_3.

Here a man watches a machine do an entire job without his intervention. The information on how to do the job, including the concept of skill, is built or set into the machine function, tooling, and control system. Examples of A_3 machines are automatic nail machines, automatic die-casting machines, and automatic-cycle machine tools. The clue is in the word automatic.

II The Meaning of Control

Control in its simple forms consists of turning on or actuating a station; or, for example, in the turret lathe, transferring from one operation to the following one on the same machine. Obviously, a control function built into an A_3 machine, such as a modern automatic-cycle machine tool, can also acuate the control system on a succeeding machine. Whenever you have a series of A_3 machines with integrated sequential control systems, you have true automation.

"Detroit" automation is largely of this type. Most of the individual machine tools are A_3. Conveyors, indexers, manipulators, and positioners couple the machines together. These "transportation machines" between the machine tools proper also fall in the A_3 class. The proof that they are A_3 is that they are completely automatic, providing all necessary energy and information by means of built-in guides.

The "information" built into a machine is really a form of programming. An automatic milling machine may follow the program represented by a master profile. No machine classed lower than A_3 can follow any built-in program, no matter how simple it is. Such A_3 programming is always accomplished by straight mechanical, electromechanical or electrohydraulic devices.

Whenever the machining program is in the form of paper tapes, punched cards, or other programs not physically set into the machines, automaticity greater than A_3 is usually required. This is so for two main reasons:

• Some computation may be necessary in following the nonmechanical program, such as paper tape.

• Machines using "paper" programs are usually of the closed-loop, self-correcting type.

For all practical purposes, today's automation is almost entirely A_3. These systems "obey" the program designed into them faithfully. This, in a sense, is a definite drawback. The machine continues producing, even if the tool is defective or the parts fall outside of set limits.

This characteristic of not automatically checking results is called "open loop" by control designers. Machines that check their work have some "judgement." These completely automatic "closed-loop" machines possess the fourth order of automaticity, A_4, say the Ambers. They monitor their own settings as necessary. You will find most A_4 machines in continuous processes. To be properly A_4, the feedback (self-correction signal) must refer the work proper to a standard.

The dimensions of parts produced on an A_4 machine usually exhibit a "natural tolerance" caused

by the organic "non-assignable" variation of the machine. Therefore, the dimensions of individual parts are usually at random, within the machine's error pattern. The size of any individual part may fall anywhere from the high to the low-tolerance limit and still be acceptable. Having a sensitive, closed-loop, self-correcting A_4 machine respond to individual measurements will only cause it to "hunt" from one dimension to another. The outcome is that the machine's error pattern is amplified. The self-correcting A_4 machine could produce more rejects than a conventional A_3 machine, without feedback, if the A_4 control system is not adequate.

One solution is to compute the machine-mean, the centerline of machine performance, for use as a self-correction index, instead of using an individual measurement. This can be done by means of built-in special-purpose analog computers. The computer calculates the machine-mean by averaging individual measurements.

III Automation's Fifth

A computer in a machine's functional or program control system indicates that it possesses the fifth order of automaticity, A_5. These machines do not depend on a direct control or feedback signal. Instead they respond to a mathematical function of the control.

The possibilities for A_5 machines, based on computer control, are endless. For example, an A_5 machine could automatically "optimize" by solving maximum versus minimum relationships. In plain words, A_5 machines can do some of the routine "design" of the product they produce. A punch press that automatically positions the stock so that the maximum number of piece-parts could be stamped out of the minimum amount of stock is one variation.

A machine-tool with a built-in automatic machinability computer would be another example. Such a machine tool would remove metal at the fastest permissible rate, taking into account the tool, surface speed, material, and other machinability variables, even if they are continually changing.

The trend is toward A_5 machines. But they may be years away because of the normal inertia of industry and the big investment in machine tools needed.

IV A Look at the Future

Let's look at two admittedly futuristic A_5 machines as postulated by the Ambers. It is entirely practical to design a steel mill to roll beams having an optimum cross section. This rolling mill would automatically adjust the spacing between rolls according to the output of a computer. The computer would accept span and load factor settings and work these into beam dimensions by solving conventional beam formulas. The result would be beams with the optimum cross section through each point of length. Obviously, this would save a tremendous amount of steel.

Most automation today consists of moving parts around so that the proper part is at the correct station at the right time. Conventional shuttles and conveyors perform these functions. But, once they are designed and installed, the system becomes inflexible.

This can be avoided by elementary military fire-control practices to sort and position parts by selective, controlled catapulting. Bold as this may sound it may well be the transport device of the future.

A machine of this type would defy obsolescence as it could readily be adjusted by merely resetting dials when so required by product changes. In this way it could accommodate and position a wide variety of stock to an unlimited number of stations.

A simple version would be to "kick" the parts across a free surface table for two-dimensional positioning and timing. This represents precision control based on the basic concepts of ballistics.

The shocks can be kept as low as necessary on both the catapult and receiver ends. In addition, the receiver need not be stationary, but can be a moving station on a turntable. This setup requires computers to solve the simple ballistics equations to determine proper catapult exit velocity, angle, time of flight, and "target" lead angle. The mass of each item can be preset on dials or obtained by automatic weighing. ●

Compressed Air Helps Pass the Salt

Digested from CHEMICAL ENGINEERING, Sept, p126

Everyone benefits from Imperial Chemical Industries' new, streamlined bulk delivery of pure dried vacuum salt (PDV) in Britain.

New delivery trucks, equipped with pressurized tanks and air compressors (like the one pictured above), below PDV salt directly into the customers' storage silos or saturators, eliminating elevators, conveyors, and manual handling.

ICI lists the following advantages of the new delivery system:

- Cheapest way of "packaging" PDV. Cost to ICI of bags, filling, stitching, and handling at its Winsford Works is eliminated.
- Customers save in handling equipment and costs, floor storage space.
- Most hygenic way of delivering and handling salt for ultimate use in foods.
- Storage sites can be conveniently located for direct delivery on users' premises.

The new trucks, each with a load capacity of 12,600 kg., can discharge a full load of salt in one hour. Compressed air blows the salt through a 10-cm. pipeline to a height of 12 m. along a horizontal distance of 9 m. Greater heights and distances can be achieved at a lower discharge rate.

Advantages of the new delivery system, ICI says, apply to small as well as large users of PDV. In the past, most users took bagged salt to avoid having to provide underground storage bins and conveyors. The new systems permits users the salt above ground and to move salt by gravity when needed. ●

CLARK EQUIPMENT moves mountains

. . . of sand and gravel **A Swiss sand and gravel producer owns this 4-wheel drive MICHIGAN Tractor Shovel, uses it to load bankrun and stockpiled material onto trucks. Power-shift transmission eliminates the conventional clutch, sharply increases operator efficiency.**

. . . Hawaiian pineapple **One man on this giant CLARK-ROSS Carrier unloads an 8-ton bin of pineapple in one minute flat!**

. . . miles of pipe **The operator of this Clark-built MICHIGAN truck crane can place a 20-ton load precisely where he wants it, simply with a flick of the wrist on the operating levers.**

. . . fragile glass vials **From packaging tables to shipping, a major pharmaceutical manufacturer moves vials of drugs with this compact Clark POWRWORKER.**

. . . building brick **These two "mobile elevators" (pneumatic-tired Clark lift trucks) double the storage capacity of a Cuban brick manufacturer—make it possible to utilize a second floor in the shed.**

Throughout the world, Clark Equipment sets the standards of efficient materials handling

CLARK® EQUIPMENT

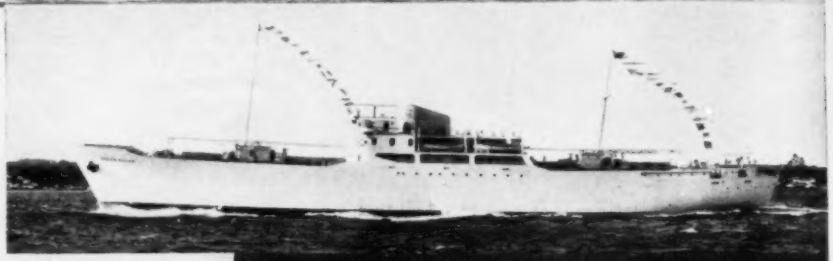
CLARK EQUIPMENT INTERNATIONAL, C. A.

BUCHANAN 4, MICHIGAN, U. S. A.

Cable Address: Interclark

Associated Manufacturers in Australia, Belgium, France, Germany and U. S. A.

"CIUDAD DE CALI" . . . One of several Flota Mercante Grancolombiana cargo vessels powered by Nordberg main propulsion and auxiliary diesel engines.



"OCEAN QUEEN" . . . refrigerated cargo vessel propelled by a single Nordberg Diesel engine, built by Framnes Mek Verksted of Norway, now operating under Italian Flag.

"ISLAS MALVINAS" . . . one of three Argentine sister ships each powered by two Nordberg propulsion engines, and four Nordberg auxiliary engines.

"SUCRE" . . . one of four Compania Venezolana de Navegacion cargo ships each powered by two Nordberg Diesel propulsion engines, and two Nordberg auxiliary generator sets.

POWERED BY NORDBERG

. . . your assurance of "On Schedule" marine operations

The design and construction of Nordberg Marine Diesel Engines provide the utmost in reliability, low fuel consumption, and accessibility to working parts. These advantages, inherent in Nordberg engines, are your assurance of dependable, low cost performance so essential in maintaining successful and profitable "on schedule" marine operations.

Built in a wide range of sizes from 10 to over 12,000 horsepower to handle practically every marine propulsion or auxiliary power need, Nordberg Marine Engines meet the standards and specifications of American Bureau of Shipping, Lloyds, Veritas and other of the world's major classification societies.

Write for details, outlining your requirements.

© 1956, Nordberg Mfg. Co.

NORDBERG MFG. CO., MILWAUKEE, WISCONSIN, U.S.A. Cable Address: NORDBERG

LONDON, 19 Curzon St., W.1. • JOHANNESBURG, 42 Marshall St. • MEXICO, D.F., Dolores 3

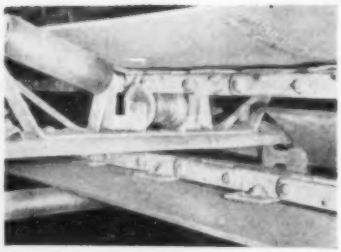
Other Nordberg Machinery includes: NATURAL GAS, GASOLINE and DUAFUEL® ENGINES . . . MINE HOISTS . . . GRINDING MILLS . . . SYMONS® GYRATORY and CONE CRUSHERS . . . SYMONS® VIBRATING SCREENS.

NORDBERG THE WORLD OVER

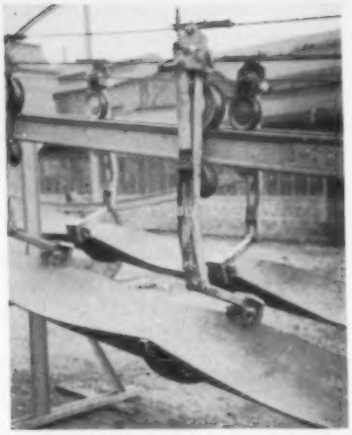
Represented in principal trading areas throughout the World

XHM156

Pictures show some of the ways European engineers are tackling problems of long runs, and steep slopes, in handling materials.



BAR CHAIN, with bearing plates, carries lightly constructed conveyor belt and also moves it along.



SUSPENDED BELT is carried by hangers that ride a rail. Wire rope (top) pulls conveyor, transmits load.

GLIDING BELT forms deep pockets that hold material. Chains support belt and hang from a wire rope.

CLEATED TROUGH on elevator conveyor lifts material up 65° incline. Cleats form solid wall over idlers.

HUGGER BELT is pressed down on regular material belt by spring-loaded tires. It is effective on steep slopes.

CURVE-GOING CONVEYOR features linked apron sections. Flexibility permits return to carry materials.

From Europe: New Conveyor Designs

Digested from COAL AGE, Aug, p77

European materials handling engineers have sponsored a number of new conveyor designs. They appear to not only save materials and reduce operating costs, but also offer much more flexibility than most present-day equipment.

These are some of their developments:

- Belt conveyors that can be built to almost unlimited length. At the same time they use light and inexpensive rubber belting.
- Conveyors that can handle material on the forward, as well as on the return strands, across valleys or rivers.
- Belt conveyors that carry material on inclines up to 65°.
- Conveyors that can carry bulk material around vertical and horizontal curves.

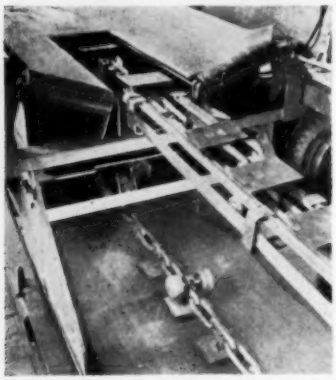
The belt of a conveyor has two functions: (1) it carries the load, (2) it transmits power from a driving pulley to move the load. European engineers have succeeded in eliminating the second function with several unique designs.

Either a chain or a wire rope is made to pull the belt along. Thus the belt's only job is to carry material, and can be made of a relatively light construction. A lighter belt permits almost unlimited conveyor length, and cuts power requirements up to half that of an ordinary belt conveyor.

Here are some of the details. One design uses a bar chain to drive the belt. Every second or third link of the chain has a bearing plate that supports and carries the belt with the material lying on it. On the return trip, the bearing plates rest on the belt and move it along.

Another design makes use of a rubber-covered steel rope to haul the belt. But you need a special

belt. It has only a few layers of cotton and is strengthened at the edges and in a specially-designed middle section. A groove in the middle section runs the whole length of the bottom side of the belt. The steel rope fits into this



PLATES of chain rest on the return strand, move belt along.

groove and is gripped by the belt; the heavier the load, the tighter the grip. Material can be dumped over the conveyor head pulley or at any point along the conveyor path by raising the belt and tilting it.

Suspended Conveyor Belt—Combine a belt conveyor with an ordinary ropeway and you get what is called a suspended conveyor. Hangers, spaced 1.5 meters, are suspended from a rail beam. The bottom of each hanger has a ringed tray that supports the belt (see picture page 41).

A wire rope above the rail ties the hangers together and moves the belt along.

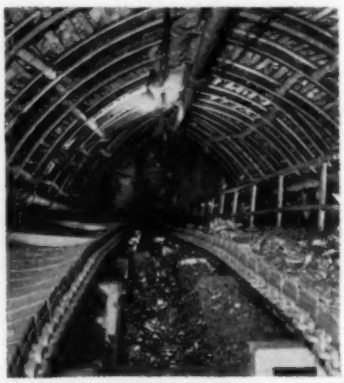
Material can be loaded onto the conveyor at any point. The hangers carry the belt in the same positon on the forward and return runs. So materials can be carried in either direction without a change in construction or equipment.

At the discharge point the trays are tilted and the belt takes a vertical position.

Gliding Belt—German engineers call a combination of conveyor belt and ski-lift a "Schwebeband," or "gliding belt." The ski-lift seats are replaced by a troughed conveyor belt hung from chains, fastened at the edges of the belt and to the rope. Here also, the rope moves the belt along.

Deep dents are formed at those points where the chains are fastened to the belt. These dents break the belt into cells that tightly squeeze the material. Back sliding of the material is prevented. Angles up to 30° offer no difficulties.

Elevating Conveyors—A German troughed belt carries material up a 65° incline at a speed of 60 to 90 m. per minute. Cleats prevent the material from rolling back. Two



RETURN STRAND (right) can also carry materials, here, into a mine.

cleat sections are fastened to the belt parallel to, but independent from, each other. These sections close up to a solid wall when the belt is led over troughing idlers and prevent sliding of the material.

"Hugger" Belt—Still another approach to the problem of conveying material up steep slopes is the hugger belt. It is an auxiliary belt that holds the material tightly onto the carrying belt. The hugger belt is pressed down on the material by spring-actuated conventional automobile tires.

Curve-Going Conveyors—One design uses "linked" aprons to allow the conveyor to negotiate horizontal curves. The linked apron conveyor is flexible enough to permit the return to travel in a vertical plane. An additional twist even makes it possible to carry material on the return trip (see picture above).

Ten conveyors of this type have been installed in the German Ruhr. Some are as long as 2,460 m. with power consumption low. German engineers predict a great future for this design. ●

Inquiries invited from established agents in certain areas.

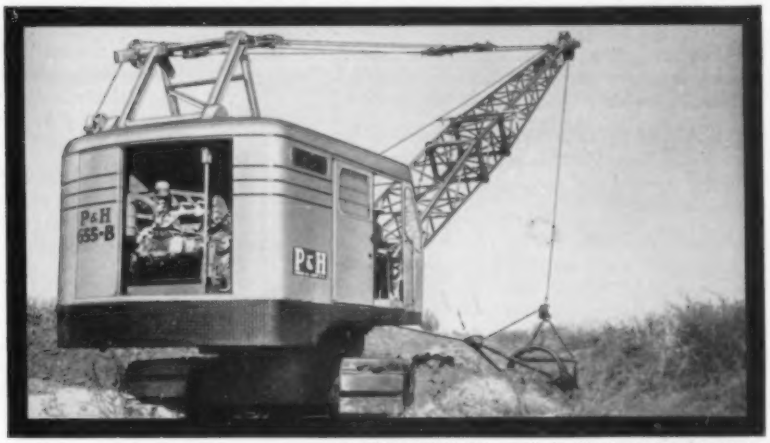
CLEMSON BROS., Inc.
Middletown, New York, U.S.A.

MAKERS OF HAND AND POWER HACK SAW BLADES, FRAMES, METAL AND WOOD CUTTING BAND SAW BLADES AND CLEMSON HAND AND POWER LAWN MOWERS.

A P&H Model 105TC *(10 ton capacity) pouring concrete in Puerto Rico*

P&H POWER CRANES and SHOVELS

for every digging or lifting job



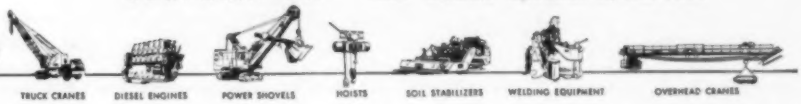
A P&H Model 655-B (1½ *cu. yd.) dragline in canal work in Mexico*

Whether you require a truck crane or crawler, P&H has a size and model that fits your needs. Available with gasoline, diesel or electric power. Convertible to all front end attachments. Your local P&H distributor has complete details.

HARNISCHFEGER INTERNATIONAL
CORPORATION Cable "Harninco" Milwaukee 46, Wis., U.S.A.

HARNISCHFEGER EXPORT
CORPORATION Cable "Harnexco" Milwaukee 46, Wis., U.S.A.

the P&H *Line*



Reaching for the moon

Once it meant the impossible...today it's a progress report on scientific research

WHO DARES call anything impossible today? Not when research scientists are constantly seeking and finding new wonders to improve the way you live.

ONLY A DREAM YESTERDAY...reality today. A generation ago, Union Carbide scientists began taking oil and natural gas apart and putting the pieces together again in ways unknown to nature.

The result? A steady stream of entirely new chemicals... an average of one a month for the past 25 years. The benefits of these petroleum chemicals are everywhere—man-made textile fibers, amazing plastics, life-saving wonder drugs, enduring paints and enamels...the list is endless.

NOT ONLY CHEMISTRY has felt the touch of Union Carbide research. Alloying metals that make possible stainless and other fine steels, oxygen from the air for medical and industrial use, a variety of carbon products—all have been developed, made better or more abundant through Union Carbide's research.

AND THE MOON? The work of Union Carbide scientists in new metals such as titanium, in rocket fuels, and in the beneficial uses of atomic energy, is helping man reach in that direction, too.

FREE: *Learn more about the interesting things you use every day. Write for the illustrated booklet "Products and Processes" which tells how science and industry use the* ALLOYS, CARBONS, CHEMICALS, WELDING EQUIPMENT, *and* PLASTICS *made by Union Carbide. Ask for booklet IM-10.*

UNION CARBIDE INTERNATIONAL COMPANY

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y., U.S.A.

Cable Address: UNICARBIDE, New York

AFFILIATED COMPANIES:

ARGENTINA: Eveready S. A. Industrial y Comercial
AUSTRALIA: Eveready (Australia) Pty. Ltd.
Metals and Ores, Pty. Ltd.
Widdis Diamond Dry Cells Pty. Ltd.
BRAZIL: Union Carbide do Brasil, S. A.
National Carbon do Brasil, S. A.
COLOMBIA: National Carbon Colombia, S. A.
FRANCE: Compagnie Industrielle Savoie-Acheson
HONG KONG: National Carbon (Eastern) Ltd.
INDIA: National Carbon Co. (India) Ltd.
INDONESIA: National Carbon Co. (Java) Ltd.
ITALY: Elettrografite di Forno Allione
MEXICO: National Carbon-Eveready, S. A., Bakelite de Mexico, S. A.
NEW ZEALAND: National Carbon Pty. Ltd.
PAKISTAN: National Carbon Co. (Pakistan) Ltd.
PHILIPPINE IS.: National Carbon Philippines, Inc.
SINGAPORE: National Carbon (Eastern) Ltd.
SWEDEN: Skandinaviska Grafitindustri Aktiebolaget
SWITZERLAND: Union Carbide Europa, S. A.
UNITED KINGDOM: Bakelite Limited.
British Acheson Electrodes Limited.
Union Carbide Limited and its Divisions:
British Electro Metallurgical Company;
Gemec Chemicals Company;
Kemet Products Company.

Union Carbide's Products include

SYNTHETIC ORGANIC CHEMICALS • EVEREADY Flashlights and Batteries • NATIONAL Carbons • ACHESON Electrodes
UNION CARBIDE Silicones • Dynel Textile Fibers • ELECTROMET Alloys and Metals • UNION CARBIDE and VINYLITE Plastics
HAYNES STELLITE Alloys • LINDE Welding and Cutting Equipment • PRESTONE Anti-Freeze • CRAG Agricultural Chemicals

How to Automate Step by Step

Digested from FACTORY MANAGEMENT & MAINTENANCE, July, p140

Don't let the word "automation" worry you. That's the feeling at Manning, Maxwell & Moore, Inc. (Stratford, Conn., U.S.A.,). The pictures show some of the simple "automated" installation engineered by the firm at low cost.

MM&M's doctrine: Start by cutting work-handling between one machine and another. Then you can add some more handling equipment between the next pair of machines—and so on until all machines are linked by mechanical handlers.

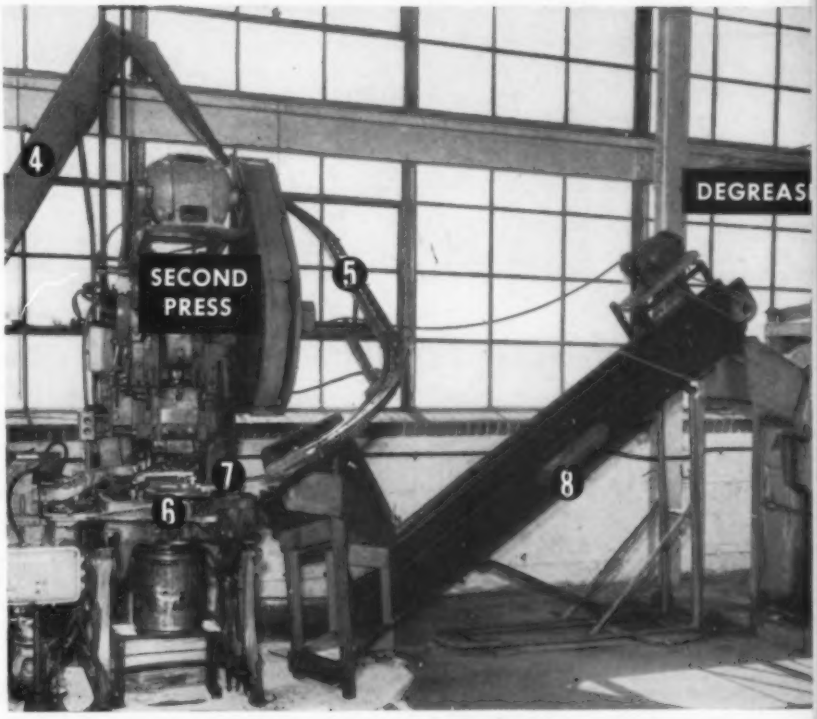
The company's investment is small, about $1,500. Most of the equipment was built in its own shops. But the return is impressive: Production moved up from 900 to 2,500 units per hour.

The machines shown here make cases for air-pressure gages. Operations are automatic; one operator controls everything. This is the automation history:

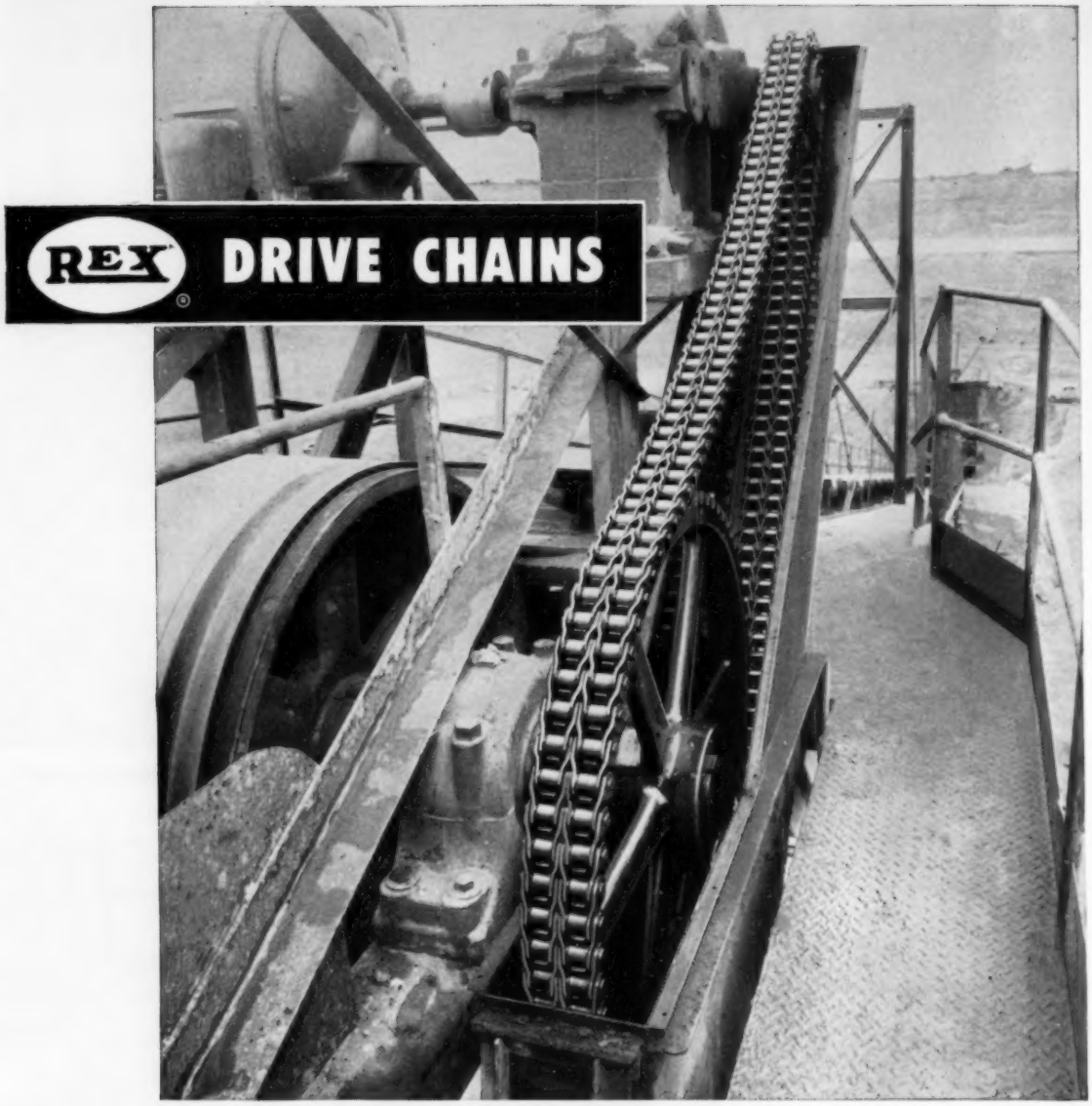
- **Installed elevator conveyor** to feed cases directly to rotary trimming shear from the first press. This eliminated tote boxes and hand feeding.
- **Two years later:** added lift conveyor to carry gage cases from trimmer to hopper above the second press.
- **Another two years later:** completed elevator-and-chute feed to second press, installed moving arm to position gage cases over die.
- **Most recently:** added conveyor to carry pierced cases from hopper, to the right of the second press, to degreaser. At the same time a feeder that feeds sheet metal to the first press was added.

Looking at MM&M's experience, you can expect a few problems if you automate in stages. Speeds of the different machines in the line may not be the same. You may need a storage conveyor ahead of the slower machine to prevent pile-ups. MM&M's first press is slower than the trimmer, so part of the time the trimmer cuts air. And changeovers from one size to another delay production. Separate chutes could solve this.

1. Elevator conveyor, 2. Line-up trough, 3. Roll-down trough



4. Lift conveyor, 5. Chute, 6. Positioner, 7. Ejector, 8. Conveyor



First choice for lasting service...

Just add it up! Top-quality Rex Chains and Sprockets plus a reputation of lasting service at lower cost...the result is continuous, high efficiency on belt conveyor, bucket elevator and other chain drive applications.

In Rex Chains you get the precision manufacture, skillful hardening and selected metals to guarantee chains of unequaled durability. And by actual on-the-job experience, Rex Chains have proved their trouble-free operation.

Why not have a CHAIN Belt Field Sales Engineer or Distributor review your power transmission needs? In his complete line of Rex Steel and Cast Chains and Sprockets, there's one exactly right for you. And he'll show you why Rex is first in reducing costs...improving efficiency. Write CHAIN Belt Company, 4654 W. Greenfield Avenue, Milwaukee 1, Wisconsin.

REX **CHAIN BELT COMPANY**

Distributors in principal cities abroad. Export Offices: 4800 W. Mitchell St., Milwaukee 1, Wisconsin; and 19 Rector St., New York City, U.S.A. Cable Address "Belt Chain"

Looking Ahead in Production

STRONGER PERMANENT MAGNETS will be possible, according to the U.S.A.'s Westinghouse Electric Corp., because of a new magnetic material that is practically 100% pure manganese bismuth. Catching fire on exposure to air (above), the finely ground powder must be prepared and processed in an inert atmosphere of helium gas. Most important feature is its resistance to demagnetization: 10 times greater than today's commercial magnets.

Manganese and bismuth are ground together in helium gas. When fully ground, the two metals are united chemically at bismuth's melting point, 253°C. This is reground to a fine powder, mixed with a plastic binder, oriented in a magnetic field, and molded or extruded to shape. The magnets can be easily machined and do not conduct electricity. (*Product Engineering, Aug, p215*)

●

ITALY'S MACHINE-TOOL NEEDS, by 1964, will be 75% greater than current demand. This is the conclusion of the Italian Association of Machine Tool Manufacturers. This forecast appears to be based on two assumptions: (1) average age of plant installed does not exceed 10 years, (2) present rate of growth of metalworking business will continue.

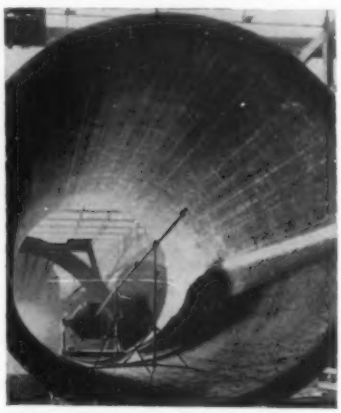
The first is open to some debate. The history of Italian metalworking just does not show a 10-year replacement cycle. And investment capital is hard to find, with interest rates high. The second assumption carries more weight. Italy's industrial output is growing at a 9% annual rate. The machine tool industry can meet most of the demands, but imports will be needed to round out a complete machine tool range. (*Metalworking Production, Aug10, p1266*)

●

SHEET-METAL PARTS, press-formed by the rubber-pad press or Guerin process, sometimes come off the press needing hand-finishing or adjustment. The parts tend to wrinkle. In a rubber-pad press, a thick rubber blanket replaces the female die. The blank rests on top of the male die. As the die is raised it pushes the blank into the rubber pad which envelopes the blank and die, shaping the blank to the die's contour.

Short Bros. & Harland, Ltd., (England) may have an answer to this problem. A polyvinyl chloride "intensifier" is used. It is shaped like the part to be produced and is placed between the blank and the rubber pad. As the press closes, the plastic intensifier's hardness irons out wrinkles. (*Rubber & Plastics Age, July, p471*)

●



RADIOISOTOPES INSPECT a longitudinal seam weld (white line, right) in a 10 cm. thick steel shell. A special film outside the cylinder records radiations from radiocobalt source in antenna. Machine in background carries the cobalt. Unit was manufactured by G. A. Harvey & Co., Ltd. (London, England). (*Welding Engineer, Aug, p48*)

●

DESALTED SEAWATER plants promise to fill fresh water needs in several parts of the world. In Israel, plans are underway to build a pilot plant that will de-salt seawater at the rate of 2,000 liters per hour. Plans have also been made by the inventor of the process, Alexander Farchin, for a full-sized plant. It can be powered by electricity, or modified, by solar heat. Farchin's process involves freezing salt water. Freezing separates crystallized water from salt impurities, themselves valuable by-products. If the plant was set up on the Dead Sea, it could produce large quantities of potassium.

In South Africa, gold mines may yield still another valuable commodity—water. A pilot plant at the Western Holdings mine treats 75,600 liters each day of the mine's brackish waste water. Cost is about 8¢ for 1,000 liters. Engineers there feel that enough is now known about the process to justify designing big desalting plants.

In the U.S.A., Fred Seaton, Secretary of the Interior, envisions pipelines carrying drinking water reclaimed from the sea by as early as 1990. (*Compiled from various sources.*)

●

SOME PREDICTIONS ABOUT AUTOS: In Detroit, capital of the U.S.A. auto industry, some stylists feel that the "no-draft," angle, window ventilator is about to pass into auto history. Already reduced to a tiny wedge on most '56 cars, the no-draft window will be even smaller on the '57's, will probably disappear altogether by 1958.

Air conditioning is the hottest topic among the automen. Some say that the industry is headed toward universal air conditioning. The prediction is that in less than five years air conditioning will be as common

as auto radios are today—in four out of every five cars.

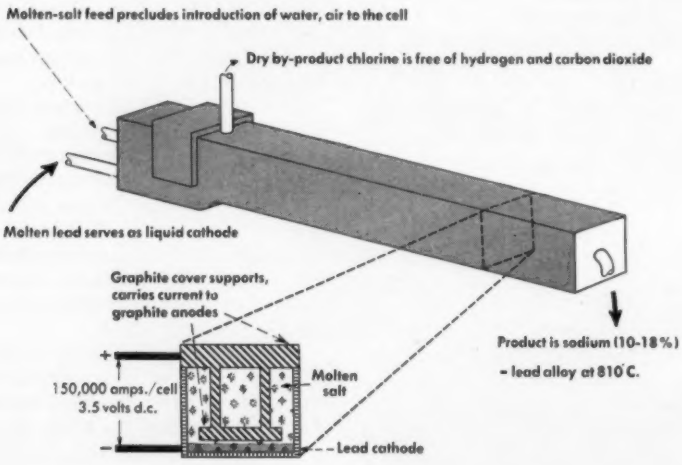
This could affect parts makers drastically. Engineers agree that air conditioning is useless if car windows are opened. They are thinking of sealing the windows tight. That means no window regulator guides. So you have the stylist's dream-come-true of a car with "flush glass." You also might have the driver suffering from the nightmare of claustrophobia. (*American Machinist, Aug.* 13, *p*105)

●

DE-INKING WASTE PAPER, by a method that is said to be both economical and efficient, might be the answer to the chronic newsprint shortage. In a process developed by the University of Texas, shredded paper is placed in water, and a detergent and salt are added to loosen and separate the ink from the cellulose. The mixture is then heated, and charged with an electric current to increase separation of ink particles from the cellulose. Finally, water is removed and the cellulose fibers bleached. The product is equal in color brightness and strength to the original pulp, and is priced below the cost of new paper. (*Product Engineering, Aug, p*213)

●

LIGHT ALLOY AIRCRAFT CASTINGS produce savings of 50% as against forged parts, according to a report made on military aircraft component manufactured in France. The investigating firm studied casting versus forging costs for components in aluminum and magnesium. Estimates cite tooling costs for forging as 30 times higher, and manufacturing time 30% longer, than for cast parts in identical materials. Studies will continue. (*Metalworking Production, Aug*3, *p*5)


Molten-salt feed precludes introduction of water, air to the cell
Dry by-product chlorine is free of hydrogen and carbon dioxide
Molten lead serves as liquid cathode
Graphite cover supports, carries current to graphite anodes
Product is sodium (10-18%) - lead alloy at 810°C.
150,000 amps./cell 3.5 volts d.c.
Molten salt
Lead cathode

New Cell Promises Cheap Sodium

The lead-cathode device sketched above, may become a cheap, quick route to more sodium capacity. The inventor, Chlorsodium Cells (New York), has estimates that show that the cell can drastically slash the cost of making sodium. (From 18¢ to 4¢ per kg.) As yet, the process is untried.

The new cell resembles a mercury cell. It slopes slightly to permit flow of the molten-lead cathode. And it uses graphite anodes. But instead of brine, the lead-cathode cell uses fused salt as an electrolyte. Completely decomposed in the cell, the salt yields pure, dry chlorine gas and sodium dissolved in the molten lead.

Unlike all other sodium cells, this cell will operate free of hydrogen and oxygen. Lack of explosive gases permits high-current densities—as high as 2 amperes/100 sq. cm. of anode surface. It will therefore, have about 10 times the capacity of the same size of mercury cell that operates at about 0.5 amperes/100 sq. cm. (*Chemical Week, Aug*11, *p*86)

Packaged Drives—Look At Them Now

Digested from POWER, Aug, p126

The trend toward automation will mean a greater need for electric motor drives with wide speed ranges. In the 1- to 200-horsepower class, demand is being met by packaged, direct-current (DC) drives. If there are none in your plant now, the possibilities are good that you will have one or more to maintain in the future.

Variable-speed drive consists of a separately excited DC motor, control station, and the "package." This package consists of alternating current-to-direct current conversion equipment, controls, overload and short-circuit protection. Motor generator sets make the conversion of AC to DC.

What you can do with the drive depends on the particular model. Most manufacturers design drives on the "building block" principle. Drives can be modified to give you many combinations of control by using different control subassemblies. Some manufacturers offer optional electronic control that provides close speed regulation, extra-wide speed ranges, torque limitation, and controlled acceleration and deceleration. Control devices for constant-tension calendering machines are easily built.

Easy maintenance is a feature of the packaged D C-drive design. These are the things to watch for:

1. **Air Intake**—Forced ventilation by a blower cools most drives. Don't block the air intakes.

2. **DC Brushes**—Brushes wear and must be replaced periodically. Seating (shaping the brush to the commutator's contour)—must be done by qualified men.

3. **Commutator**—Properly functioning commutator is smooth and shows no sparking.

4. **Contactors**—Inspect contactors at regular intervals. Stock spare coils as well as contacts.

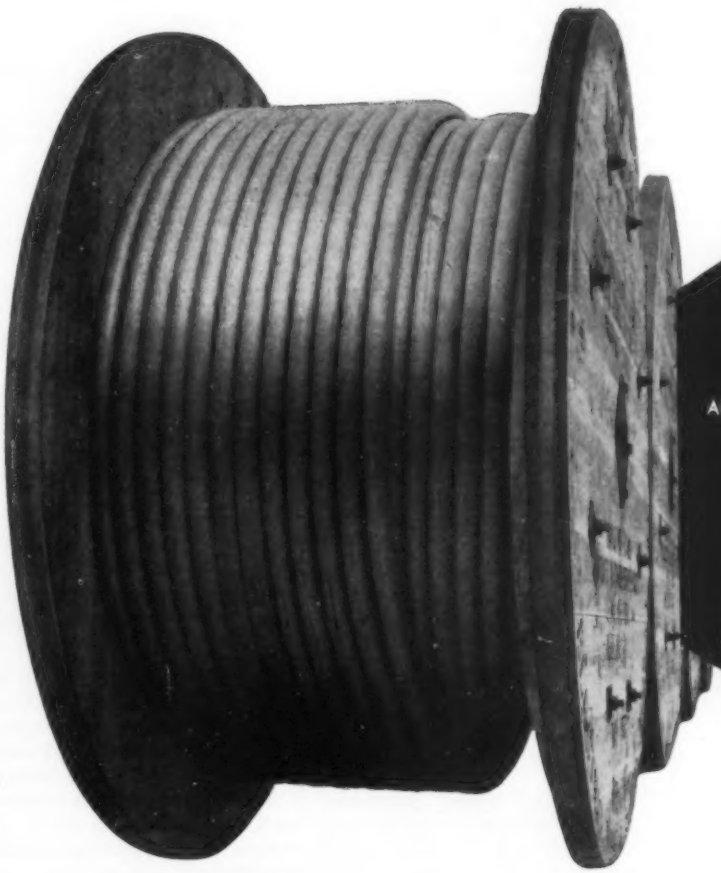
5. **Exciter**—Selenium rectifiers need little attention. But a drive with an exciter-generator should get the same care as the main generator. Electronic rectifiers need no maintenance, but stock spare tubes. ●

Trouble-Free

POWER AND COMMUNICATION

HITACHI

ELECTRIC WIRES AND CABLES



MAIN PRODUCTS

Power Cables

Communications Cables

Aluminum Cables Steel Reinforced

Magnet Wires

Trolley Wires

Rail Bonds

Bare Copper Wires

All Other Electric Copper Wires

Hitachi, Ltd.

Tokyo Japan

Cable Address: "HITACHY" TOKYO

If your business is local and limited, yet produces goods that could be sold abroad, then consider . . .

Group Exporting—Boon to Small Firms

Digested from THE TIMES REVIEW OF INDUSTRY, Aug, p13

The small company should not let smallness alone keep it from selling overseas. True, a doll-maker in Antwerp with just 6 employees, or a 2-man leather shop in Montevideo, usually does not sell goods direct and alone to a New York specialty merchant. Such transactions are too distant, too complicated, and too costly. However, there is a tested, workable answer for the small exporter: "group export."

Group export is an approach first developed by small businessmen in Western Europe about ten years ago. The really big development has come since 1954. The idea—a reversal of "collective buying"—is that many small concerns band together to sell collectively through a common sales organization. There are four main types of groups:

- The group whose member-firms are not based in the same district and whose products are not in any way related. This was the first type formed, mainly in Britain.
- The group whose members are not in the same area, but whose products are similar.
- The group whose members are in the same city or locality, but whose products are in no way related. These are usually organized by local chambers of commerce or trade associations.
- The group whose members are in the same locality and who handle allied products.

As of this autumn, several hundred export groups are operating in Continental Europe, and about 100 in Britain. In Germany, two or three hundred have been organized in the last two years. The potential in most industrial nations is great.

Look at Britain. It has about 40,000 factories employing less than 100 workers. About 10,000 of these produce exportable goods. Yet fewer than 4,000 are at present exporting, directly or indirectly.

One of the largest groups on the Continent was started in 1954 by the National Chamber of German Artisans. It was organized into six sub-groups, one in each of six major centers of Western Germany. There are about 1,000 artisans in each sub-group, all producing for export. Most of the artisans have but one or two employees. Sales results abroad, especially in the U.S.A., have been impressive.

Organization and operation of export groups follow no set formula. Generally, there are (1) autonomous groups operating on the basis of shared costs, and (2) groups operating under the management of an outside firm—for example, an export agency—which bears the operating cost.

A group of manufacturers in the same area need not be burdened with extremely heavy operating costs. One member firm can provide office space, and the others office furniture, equipment, and even personnel. A manager and one or two clerks should be able to handle the work of an export group having six or eight member companies.

The cost of the group can be borne by member firms either in

Swedes Winning Sales Battle in U.S.A.

"There is a tremendous market in the States . . . The cake is very big . . . There will always be a place for the small man, especially if he has quality and service."

The speaker (picture) is Eric Ohlsson, president of Facit, Inc., American subsidiary of Sweden's ancient but modern company Atvidaberg. Facit has found a growing market for Swedish-made office machines in the U.S.A.

Last year Facit calculator sales in the American market were considerably more than 22,572—the total number exported by American calculator-making companies. Other Facit products—typewriters, adding machines, etc.—marked up a 32% U.S.A. sales increase from 1954 through 1955.

Like Atvidaberg, most large Swedish industries thrive on export business. Swedes are cheering now about their growing sales to the U.S.A.—this year at a rate of 25% higher than in 1955.

Behind Sweden's—and Atvidaberg-Facit's—success story are three elements. Sweden's aggressive industrial management, its skilled labor with high productivity, and its technically advanced products (*Business Week*, Aug 11, p100).

equal shares, or in proportion to their shares in total turnover. According to some observers, the most effective system is to share costs equally in the first year and proportionately thereafter.

Finding a qualified export group manager is not easy. The manager must (1) have a working knowledge of export techniques, (2) be able to work independently and be tactful enough to serve a number of masters, (3) be aggressive enough to handle hard selling jobs, and (4) have a practical knowledge of several languages—the more the better. You may get help in selecting a manager from the leading export trade association in your city or country.

The manager's first task is to assist each member firm in planning its individual export program. He must advise on suitable items for export, discuss packaging, and help to produce price lists and other printed matter to be translated and illustrated. He must assemble the best possible collection of product samples, drawing equally from all firms.

He then must organize an effective "sales approach" and contact reputable overseas agents. Gradually he must build a strong selling organization, including profitable contacts for promotion and advertising.

Coordination of the activities of all members of the group is the manager's big problem—on the day-to-day operating level. Volume of production, type of production, pricing, inventories for export—these plus a score of other operations must be reasonably coordinated. For example, the manager must make certain that orders executed by different member-firms for the same agents or customers are shipped together to obtain maximum savings in freight charges.

During the introductory period a common letterhead should be used. It should list the names and products of all member companies. Later, when orders begin to arrive, the letterheads and invoice forms of the individual firms should be used to make clear that the group's office is not just a "go-between" or middleman, but actually is the export department of each member firm.●

▶ YOU AND YOUR PERSONAL AFFAIRS

Poor reading ability may be costing you 15 working hours a week—or more. If you are an "average executive" you read about 15 hours in the office each week, and spend another 15 at home with business and related reading. And if you are lucky—or happen to have a good basic training in reading in school, which is unlikely—your efficiency in reading is around 50% of capacity. (The average adult with just average schooling uses only about 20% of basic ability.)

Visual training and practice—a minimum amount, maybe just two or three hours a week—can double your reading speed in two to four months. This does not mean learning to skim or scan. It means complete and more comprehensive reading, not simply a speed-up without regard for efficiency. Better reading, as the result of a professional reading course, produces increased speed (up to three or four times your present rate), better understanding of material, and improved concentration. In the hands of an expert, most trainees increase their reading rate 100%, and their comprehension around 20%. Quite a few—maybe a fourth of all trainees—manage to triple their reading rates.

You learn to take bigger visual bites from the printed page. Instead of reading separate words, or individual syllables, you learn to read by thought units. Instead of laboring with 250 words—an average speech rate—you glide through scores of *ideas* and consume 500 or 700 or even 1,000 words in a minute.

If you read word by word . . . dot by dot . . . you spend needless time and energy. /But if you read/ /by thought units/ /or bracket by bracket/ /you not only/ /speed up reading/ /but you also/ /obtain a clearer understanding/ /of what you read/. /So say the experts/.

Best place to inquire about a training course is at the leading university in your area. Reading courses have been introduced by schools in Western Europe, and in Latin America and parts of Asia. Commercial experts are also established and growing.

The training approach is fairly simple. First you find out exactly how inefficient you are as a reader. Next, you are trained to read a broader span of numbers in a single fixation. A flash meter flashes numbers on a screen at speeds up to 1/100 of a second. You start by identifying four digit numbers, then go up to seven, eight, or nine digits. Finally, you practice with an electrical pacing instrument, with a shutter which lowers over the page as you read. It covers everything but the line to be read. You set the pacer at faster and faster speeds.

For practice at home, try this: Take a newspaper. Draw a pencil line down the center of a column of print. Practice reading the column, fixing your gaze as close to the line as possible. Start by moving out just a bit on either side of the line, then stick to the line.

Try looking just above or below each line, instead of directly at it. This develops fuller use of peripheral vision.

Center of Attention: The Profitable Package

Digested from MODERN PACKAGING, July, 73

Do you worry about your product's package? If you do, you are not alone. Packaging is rapidly becoming one of management's most pressing concerns.

Some of the important aspects of "packaging policy" have been highlighted by a recent American survey. The Folding Paper Box Association recently interviewed —personally—executives of 307 food manufacturing and processing companies. The group included manufacturers of soap, tobacco products, and beverages as well.

Survey results are revealing to all package-minded businessmen, in and out of the food industries, and in all countries where packaging-for-retail is fast-moving and competitive. These are the major findings:

- American food manufacturers —who collectively use more packages than any other industry— spend 10% of gross income on packaging.
- Emphasis is on increasing sales with attractive packages, not on packaging economy.
- General opinion is that a change in consumer packaging can—of itself—cause an increase in sales.
- Almost half the companies surveyed now have "packaging committees" (members of management, permanently assigned); more than half use some kind of research technique to pre-test new packages.
- The sales manager usually has more authority than other executives when it comes to making packaging decisions.
- Assuming the 10% figure to be accurate, the companies spend less of their gross income for packaging than for selling and promotion. Sales and promotion expenses average 19% of gross.

Appearance—Display value and customer attention are regarded as more vital than cost. Cost ranked in seventh place on the list of factors that influence packaging decisions. And all six of the elements listed ahead of cost are closely related to display value and consumer attention — (1) brand identification, (2) visibility, (3) emotional appeal, (4) display value for handling, (5) facility for stocking by retailer, and (6) advertising value.

Emphasis on display factors indicates, too, the keen interest of manufacturers in such things as shelf sizes, display facings, recipes (foods), related-item selling, special sales offers and promotional prizes. It also helps to explain the eagerness for statistics on consumer reactions to such things as multi-unit packs, larger or smaller sizes, new type packages (squeeze bottles, for example), and combination packs (containing two or more items).

Allocation of Costs—Many of the executives interviewed said they believed that more than 20% of total packaging costs should be allocated either to sales or advertising expense, and that the remaining cost should be charged against production expense. A number of firms have begun this practice. Among the items of packaging expense charged to sales or advertising were package design, artwork, market research, and engravings.

Organization—As to organizing responsibility for packaging decisions, the survey shows that "no one pattern fits any two companies exactly."

The "packaging committee" idea seems to be the trend. About 44% of the firms surveyed now have such a group acting as a regular staff unit to handle packaging policies and decisions. Nearly 80% of these committees have from three to five members. The general sales manager is active on 63% of the committees; the president, on about 53%; the advertising manager, on about 45%; purchasing agent, 40%; production manager, 26%.

Planning — About 50% of the food (and related) packages that reach the U. S. market today are the result of planned procedures— reflecting, perhaps, the increasing reliance on product and market research methods in today's economy. About 49% of the companies reported that their most recent package was planned on the basis of advance study or analysis.

About 50% of the companies reported that they have definite policies governing (1) package color, (2) trademarks, (3) size, shape and construction of packages, and (4) design. Only about 33% have a definite policy covering illustration, label information, cost, or retailer requirements.

More than 54% of the executives said their companies have a policy of pre-testing new or revised packaging; some said they use only their sales figures on previous packages as a guide to the probable acceptance of new packaging.

About 80% of the concerns had introduced at least one new package during the previous year. The average lapse of time between new packages (not for the same product) was 14 months. Only 3% of the companies had not introduced a new package in five years or longer. About 70% of all new packages were for existing products, 30% for new products.

Three-fourths of the executives believed that a package change— of itself — would stimulate a "measurable increase" in sales. About 38% of the concerns said their most recent packages had been designed by package supply firms; 24% had hired independent designers; 22% used advertising agencies for package design; 19% employed their own company artist. ●

In Marketing...

TOMORROW'S HOUSEWIFE may do her shopping by pushbutton (picture above). The Independent Grocers' Alliance of America introduced its new electronic vendor at a recent convention in New York. This month or next, six IGA stores will try the device. The shopper (1) puts a "key" containing an electronic recorder into a slot, (2) presses lettered pushbuttons corresponding to items in the showcase, (3) takes the key to the cashier where the items are "ordered" by inserting the key in another slot, (4) pays amount key indicates, (5) gets automatic delivery. (*Business Week*, July 28, p61).

●

FROZEN FOODS are gaining a bigger British market. Unilever's subsidiary, Birds Eye Foods Co., recently opened a new frozen food "cold store" at Great Yarmouth, England. The store is the biggest frozen food store outside the U.S.A., has a capacity of 2,500 tons (3,700 tons planned for the near future). Unilever says frozen food demand is growing fast, and now has 11 freezing plants and 40 cold storage depots in Britain alone (*McGraw-Hill World News*).

●

SPAIN'S floating trade fair (the new 15,000-ton ship Ciudad de Toledo) has hoisted anchor and set sail for the Americas. Idea is to promote sale of Spanish-made goods. Ports of call include Buenos Aires, Rio de Janeiro, San Juan, Havana, and one city in the U.S.A.—New Orleans. Show will run until Christmas, hopes to play to 3-million people.

▶ FINANCIAL DIGEST

Americans have begun to reap a rich reward in profits from investments abroad. Total earnings last year established a new high of $3,100-million (see page 18).

This sum includes record earnings for American portfolio investment—that money put into foreign securities as opposed to direct ownership of business or industrial facilities. More and more American investors are buying foreign securities. And 1955 brought them a record return of $260-million, a 15% rise over the previous year.

Given a steadily expanding world economy, you can expect a rising tide of American purchases of foreign securities. And you can expect industrial corporations around the world to try to make it easier for the Yankee investor to buy their shares.

Here are some of the reasons for the increasing American interest in portfolio investments abroad:

• Business in Canada, Europe, Latin America, Asia is becoming more productive. Company earnings are rising.

• The return on the foreign investment dollar begins to look more attractive in the U. S. A., where rapidly rising share prices have caused percentage dividend yields to drop. In the U. S. A., share prices of perhaps 10 times annual earnings are about average. Foreign securities usually sell at lower ratios. (Several Brazilian stocks recently sold at only 3⅓ times earnings.)

• Some governments are endeavoring to attract more investment by liberalizing their tax laws to the benefit of the outside investor. The U. S. government is cooperating, by negotiating treaties eliminating double taxation.

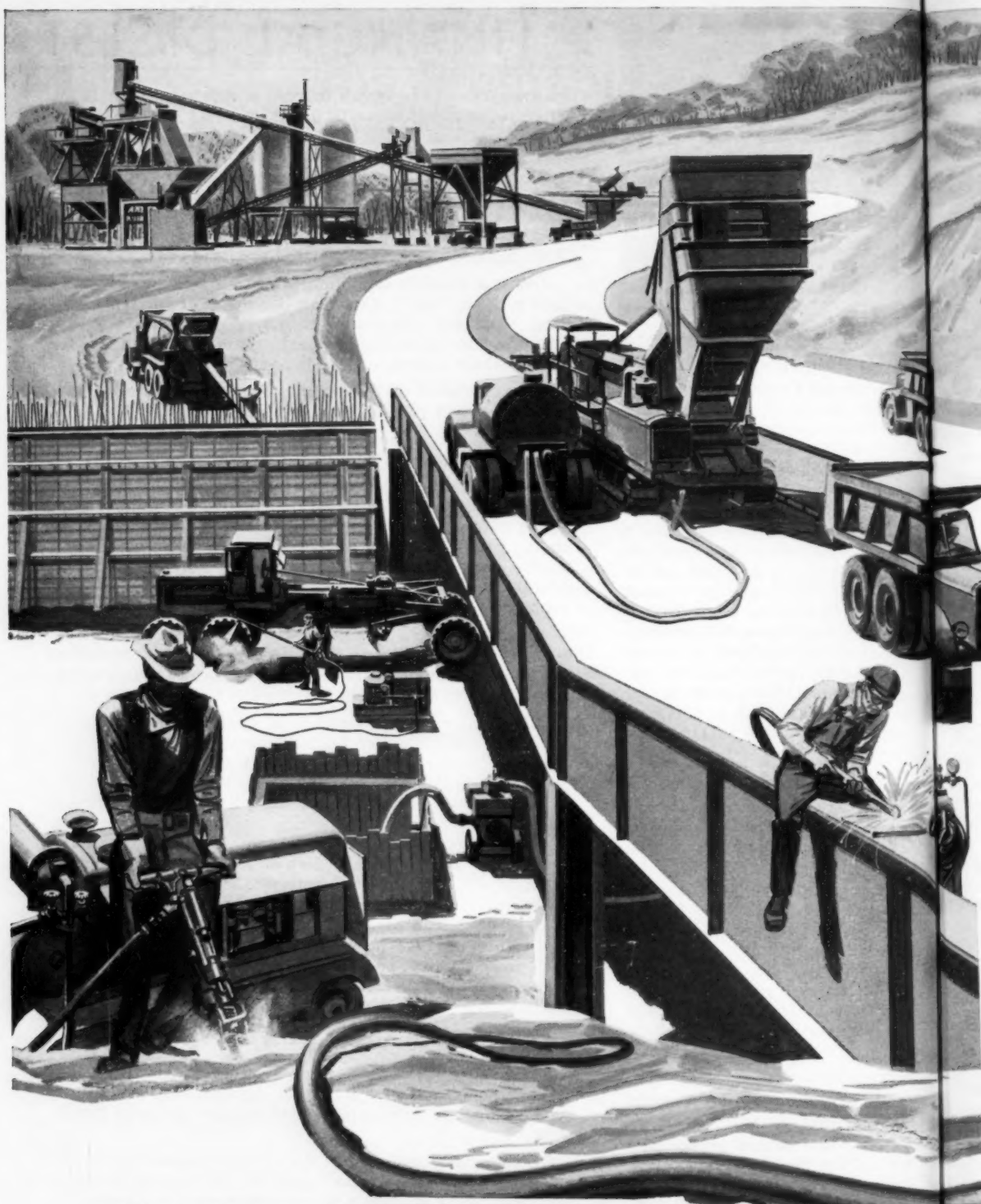
• Foreign companies—and U. S. banks—are working together to make it easier for an American to buy industrial shares. Through the device of American Depositary Receipts, a securities transaction is speeded up from weeks to days. These "ADR's" are nothing more than certificates issued against actual shares deposited in banks overseas. About 80 large concerns have set up the ADR system in New York. They include British Motors, British Petroleum, Burmah Oil, De Beers Consolidated Mines, Montecatini (page 16), Siemens & Halske AG., Unilever, N. V.

Growing interest in foreign securities is another sign that Americans are becoming more aware of foreign opportunities. As long as world business expands, and as long as the danger of sudden nuclear war seems remote, the investment will continue, and American security holdings will become more and more "international."

To be sure, big disadvantages remain—and they discourage many would-be investors. One problem is the vast shoal of currency restrictions that hamper overseas investment.

An American will find it difficult to obtain his money when he decides to sell. In Japan, for example, an investor may wait up to six years to repatriate capital invested in a Japanese security. He can sell the security, but the money must wait in Japan.

Finally, an incident such as the nationalization of the Suez Canal Company makes the American think twice about putting money into anything outside his own borders.



INTERNATIONAL DIVISION

STAMFORD, CONNECTICUT, U. S. A.

CANADA, Montreal, P. Q., Hewitt-Robins (Canada) Ltd., 2052 St. Catherine St., W.
ENGLAND, London W 1, Hewitt-Robins (Great Britain) Ltd., 8 Cavendish Place
FRANCE, Paris 2e, Hewitt-Robins Internationale, 9, Boulevard des Italiens
NETHERLANDS, Amsterdam, Hewitt-Robins (Holland) N. V. Vondelstraat 57
SOUTH AFRICA, Johannesburg, Robins Conveyors (S.A.) Ltd., P.O. Box 4736
EXPORT DEPARTMENT: *NEW YORK 17, N. Y.* Hewitt-Robins Incorporated, 370 Lexington Avenue

FROM BYWAYS TO HIGHWAYS

Everywhere in the world the demand for new highways is heard. To construct these multi-lane turnpikes many highly specialized types of equipment and tremendous quantities of raw materials such as sand, gravel, cement and crushed rock are required.

Naturally, materials handling plays a most important role in any major highway project. That's where Hewitt-Robins fits right into the picture. For we are specialists in the design and manufacture of hose to handle all types of liquids and gases . . . also vibrating equipment and belt conveyor systems to process and handle aggregates in bulk.

Construction is only one of the many industries which Hewitt-Robins serves. Wherever material must be conveyed by hose or belt conveyor system or sized by vibrating screens, Hewitt-Robins has—or can develop—the right equipment to meet your most specialized requirements.

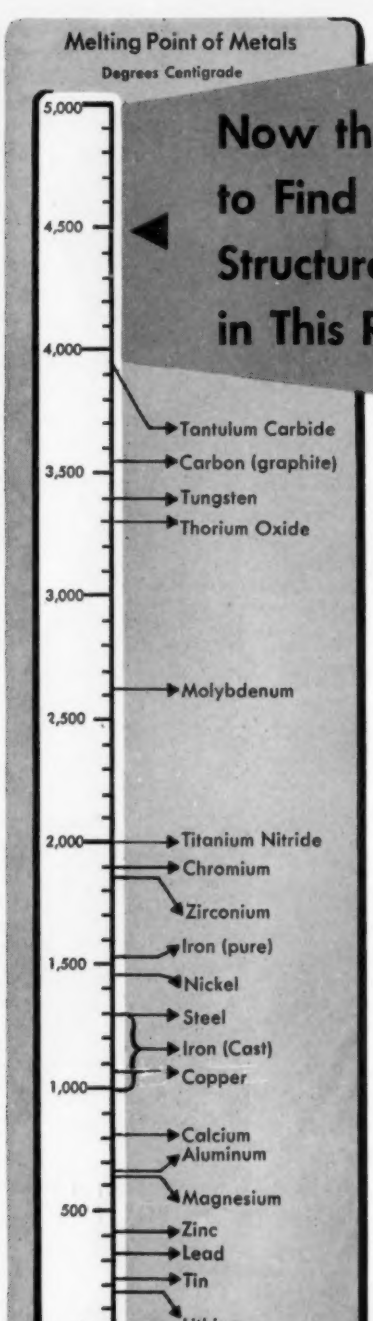
For information about Hewitt-Robins products and services for handling or processing materials in bulk, contact one of our foreign subsidiaries or write to our Export Department in the U.S.A.

HEWITT-ROBINS

DUSTRIAL HOSE • CONVEYOR BELTING AND MACHINERY • VIBRATING EQUIPMENT • DESIGN, MANUFACTURE, GINEERING AND ERECTION OF BULK MATERIALS HANDLING SYSTEMS • "JONES" POWER TRANSMISSION EQUIPMENT

A Look at High Temperatures

Digested from BUSINESS WEEK, July 21, p83



Now the Hunt Is on to Find Structural Materials in This Range

THE researchers working on things such as rockets and new chemical plants are pushing temperatures up to such fantastic heights that they have generated quite a problem for themselves: finding metals and alloys that will withstand temperatures 10 times hotter than the surface of the sun.

The solution that seems most promising to them at the moment may look a little strange to the layman. The researchers are looking for ways to make new metals out of non-metals—ammonia, or hydrogen. By squeezing the molecules of these substances so hard that they shrink in size, the scientists believe they can change them into entirely new substances, with an entirely new set of characteristics.

This was one of the approaches to the materials problems posed by high temperatures that were discussed at a symposium held recently at the University of California. About 640 scientists from all over the world attended the meeting.

Industry's Interest

Despite the fact that the military is sponsoring most high-temperature research, businessmen have a big stake in the ideas the scientists talked about. Right now there is no metal available that can withstand over 3,500°C. The temperature graph at the left shows the degree of heat the various metals now used by industry can withstand.

But even these metals are not always adequate for some of the jobs industry would like to do. None, for instance, can contain the one-million-degree heat needed to get atomic energy from hydrogen —and this is hampering atomic fusion power development.

In addition to atomic power, industrial applications might include reduction of ores, preparation of pure metals, cracking of hydrocarbons, fixation of nitrogen, and gasification of coal. Furnace materials with a higher melting point might conceivably mean that aluminum and iron could be wrung out of their ores with far greater economy, and certainly greater efficiency.

Dr. H. Tracy Hall, discoverer of General Electric Co.'s synthetic diamond process, feels certain that new metals will eventually be developed by subjecting currently available substances to tremendous pressures. Ammonia, which at ordinary temperatures is a gas, already has been changed into a metal when put under 200,000 kg/sq. cm. Other substances, he feels, can be expected to act in the same way.

It is not foolish to speculate in terms of temperatures higher than 2,000°C. ,either. Science already has learned how to generate heat of this magnitude. Nuclear reactors for high temperature reactions (up to 1,400°C.) already appear technically feasible. And U.S. Atomic Energy Commission predicts that once industry clearly understands what such reactors can mean to manufacturing operations, it will demand even higher temperatures. Some of the reactions that will immediately be involved include production of acetylene from natural gas, production of hydrocyanic acid from methane and ammonia. The prospect of

economic production of such compounds is one reason why the problem of finding materials with a higher heat resistance is so urgent.

II Today's Materials

The scientists at the California symposium continually returned to the question of what could be done to make materials already available serve for the time being. Their discussions centered around ceramics, borides, carbides, refractory oxides, and cermets (materials composed of ceramics and metals).

At the moment, ceramics would appear to hold a slight edge over other candidate materials. They alone remain strong under high temperatures. But they are extremely brittle. Countless research hours have been spent in trying to make them tough and ductile at high temperatures—with little real success.

However, the researchers discussed an experiment that may point the way toward removing the brittleness from ceramics when they encounter high temperatures:

Ice, immersed in isopentane, was held at −1°C. with a heavy weight on it. After 24 hours, the weight caused no change in the ice. Isobutyl alcohol was then added to the isopentane. And the ice failed —changed its state from a solid to a liquid—in 40 minutes.

When a chemical compound, trade-named Aerosol OT, was added to the isopentane under the same conditions, the ice appeared to become ductile. A researcher put it this way: "The ice began to flow slowly and bent through an angle of 15° in 24 hours."

This presents a strong hope for ceramics. Some similar compound, added to the basic ceramic ingredients, possibly could give comparable ductility to ceramics at high temperatures. Experiments along these lines certainly should help throw some valuable light on the physical properties of ceramic materials.

Even though the right materials are not yet available, scientists are raising temperatures still higher. At the University of California they discussed how to generate, sustain, and utilize high temperatures.

One way to get high temperatures is through a solar furnace. But it has limitations. The sun must shine and the furnace yields its energy only over a very small area. The physicists have other techniques. Such familar devices as the carbon arc, concentrated arc discharge, electrical resistance and induction heat, and nuclear reactors all are capable of generating super high temperatures. Some of these devices will sustain an optimum heat indefinitely. Others hit their maximum temperature for only the tiniest fraction of a second.

III Are Engineers Ready?

The pace of developments in the high temperature field may well be set by engineers. The engineers will probably solve the technical problems involved. But will they be equipped technically, temperamentally, and intellectually to deal with extreme temperatures and the new materials they require?

This question was posed inferentially by Dr. Wolfgang Finkelnburg, head of research at Siemens-Schuckertwerke, one of Germany's biggest electrical manufacturers. He illustrated how the engineer would have to redirect his thinking by pointing to the behavior of nitrogen at increasing temperatures. Nitrogen undergoes a molecular change at 7,000°C., a thermal disassociation of molecules at 12,000°C., a double ionization at 20,000°C., and a predominance of free electrons at 30,000°C. Such changes in state are radical; they change nitrogen from a gas that is an excellent insulator to a thermal plasma (a state midway between solid and liquid) that is an excellent electrical conductor. The change is so radical that Finkelnburg says it justifies a completely new concept of thermal plasma—as a fourth state of matter, alongside gases, liquids, and solids.

The temperatures involved in changing the state of nitrogen or other materials range from 4,000°C. to 50,000°C. This expands almost tenfold the temperature range now understood by the engineer. And it brings him into touch with the kind of theoretical thinking that you find now only among astrophysicists. ●

Will Superalloys Slow Production?

Digested from AMERICAN MACHINIST, Aug 13, p117

While researchers stumble over the problems of high temperatures (preceding page), metalworking management must begin its search for the machines to work the new heat-resistant materials.

Few machine tools now in use can be converted economically to the machining of these materials. That is the conclusion of a report to the U. S. Air Research & Development Command. Most of the report's observations apply to the aircraft industry. But, as other industry makes use of heat-resistant materials, their interest in the new machines is bound to increase.

With cutting speed as the basis of comparison, the report shows that today aluminum is cut at surface speeds up to 450 m. per minute in general-purpose machines and 4,500 m. per minute in special machines. Typical speeds for the heat-resistant materials are generally less than 30 m. per minute. This drop in capability will, in effect, result in a 25-year setback in production rates.

Making allowance for probable improvement in cutting tools and know-how, a machining time increase of about 4 to 1 is considered realistic. Suggested approaches—together with the report's evaluation in parentheses:

1. **Develop a new material** with the high-temperature strength required and the general working characteristics of aluminum. (Though considered Utopian, the approach was believed worth investigating.)

2. **Develop annealing processes** to produce machinable structures and hardening processes with no growth or distortion. (Not considered likely, but worthy of basic research.)

3. **Manufacture parts of largest possible size** as close as possible to finished dimensions by forging, extrusion, or casting. (Considered a promising approach. Further research in roll forging and precision casting is necessary.)

4. **Develop new concepts of**

A WORLD of Experience in Solving Dust Problems

PROCESS dust and its accompanying problems know no boundaries. That's why American Air Filter Dust Control Equipment is accepted and used in major industrial areas throughout the world.

AAF's intimate knowledge of industry's varied dust problems is based on almost 25 years of successful engineering experience. And with this experience has come the development of today's most complete line of dust control equipment—dynamic precipitators, hydro-static precipitators, dry centrifugals and fabric arresters.

Whether it's flour or foundry dust, American Air Filter has a unit designed to solve the problem efficiently and economically. For complete information and name of nearby AAF representative, call or write—

AAF

American Air Filter
COMPANY, INC.
255 Central Avenue, Louisville 8, Ky., U.S.A.
AIR FILTERS—ELECTRONIC PRECIPITATORS—ROTO-CLONES
Cable Address: AMFIL

ADVANCE

The World's Largest Exclusive Fluorescent Lamp Ballast Manufacturer

Satisfy more demands for fluorescent lamp ballasts with the Advance line, the world's largest and most complete line of fluorescent lamp ballasts. Make more profit too, because with a complete line you can satisfy every need and make more sales.

• • •

Advance offers manufacturers, specifiers, installers, and users of fluorescent lighting a fluorescent lamp ballast that is engineered and built to the highest standards, ballasts recognized world-wide for outstanding performance and dependability. Performance and dependability that has made Advance the world's largest exclusive manufacturer of fluorescent lamp ballasts.

Whether distributor or user, write Mr. Theodore Ley, Export Mgr. for descriptive literature.

The Heart of the Lighting Industry

ADVANCE
CBM CERTIFIED
World's Largest Exclusive Manufacturer of Fluorescent Lamp Ballasts

TRANSFORMER CO.
2950 No. Western Ave. Chicago 18, Illinois, U.S.A.
Cable Address "Adtrans"

stock removal, such as chemical milling, electrical and ultrasonic methods.

5. **Development of better cutting tools** and continued development of machines to fully utilize them. (Until new concepts are proved, this method is mandatory.)

Industry people had a chance to include in the report their opinions as to what equipment and methods were needed. Here are some highlights:

• **Turning and boring equipment** must be more rugged. Eliminate as many joints as possible between tool and carriage. Gear trains should be eliminated and replaced with electrical or fluid motors with adjustable speeds.

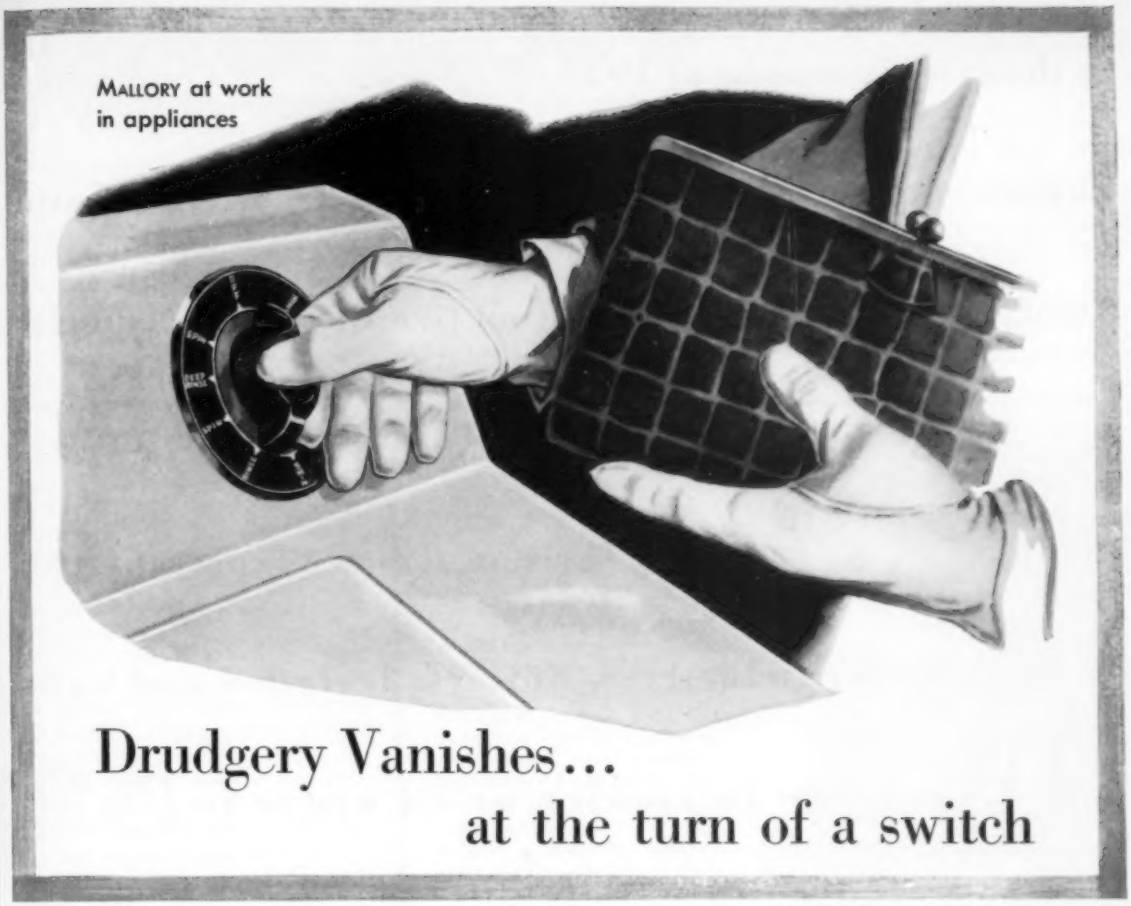
• **Milling machines** also will have to be more rugged and have higher horsepower drives. Routing of large blanks in thick packs cannot be done effectively on hard materials. A new method must be developed to avoid sawing of single sheets or thin packs that require filing or grinding of sheet edges. All milling machines should have hardened ways.

• **Radial drills** of the cantilever type are considered inadequate for the newer materials. Needed are drills of the gantry type with rugged construction and high horsepower. Because of the tendency of new materials to work harden, thought should be given to reversing the spindle and feed for chip removal before the drill is withdrawn. Electrical discharge and ultrasonic methods need to be developed as portable tools.

• **Mechanical punch presses** are satisfactory. Principal need in **hydraulic press** forming is for rubber or synthetic pads that will withstand temperatures to 540°C.

• **Broaching equipment** is desired by some people. Designs should include horizontal tables at convenient working heights and a vertical broach pulled from below. New interest in portable broaching equipment for assembly operations.

Most of these machines are used in other industries. Sooner or later the heat-resistant alloys will become commonplace raw materials. Meanwhile it will pay metalworking management to study the machining problems that will come with the new materials. ●



Drudgery Vanishes...
at the turn of a switch

In millions of homes, tireless appliances take on time-consuming tasks... their operations made more automatic, more dependable by Mallory timer switches

THE modern housewife counts on push-button controlled appliances all over the house to handle tiring, time-wasting work that used to be such a burden. Automation ih the home is due in part to a number of precision products that Mallory has developed for appliance manufacturers.

For example, precision-built Mallory timer switches make possible automatic operation of dishwashers, clothes dryers and home laundries.

Nearly every kind of appliance made for the home has a touch of Mallory in it—contacts in electric toasters, and furnace thermostats... electronic parts in television and radio sets . . . switches in ironers and air-conditioners.

Mallory's research ingenuity and precision products, in the fields of electronics, electrochemistry and specialized metallurgy, are serving leading manufacturers throughout the world. If your interest lies in fast growing industries such as appliances, aviation, automobiles, electronics and television, we invite you to utilize our specialized facilities and experience.

Mallory Affiliates in Great Britain

Mallory Batteries, Ltd.
Dagenham, Essex

Mallory Metallurgical Products, Ltd.
Hatton Garden, London, E.C.1

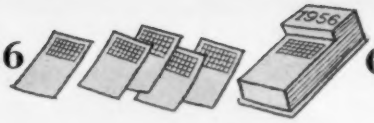
P.R. MALLORY & CO. Inc.

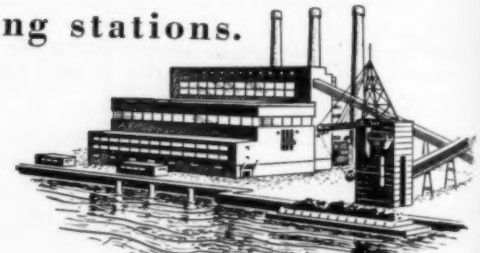
MALLORY

SERVING INDUSTRY WITH THESE PRODUCTS:

Electromechanical • *Resistors, Switches, Tuning Devices, Vibrators*
Electrochemical • *Capacitors, Rectifiers, Mercury Batteries*
Metallurgical • *Contacts, Special Metals, Welding Materials*

P. R. MALLORY & CO. Inc. INDIANAPOLIS 6, INDIANA

In the first six months of 1956  Combustion Engineering received orders for boilers from eight Latin American countries... from five European countries ... and from four Near East and Far East countries. These orders are representative of 14 different industries. Boilers, designed and built by C-E are now in service or on order in 52 countries outside the U.S.A. They range in size from those suitable for a very small plant to those for the largest power generating stations.



Combustion Engineering, its associated companies, representatives and licensees around the globe, will gladly help you work out the best solution to your steam generating problems. Write to our Export Department in New York.

COMBUSTION ENGINEERING

Combustion Engineering Building • 200 Madison Avenue, New York 16, N. Y.

C-E

B-948

STEAM GENERATING UNITS; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; HOME HEATING AND COOLING UNITS; DOMESTIC WATER HEATERS; SOIL PIPE

Multiple Virus Killers May Be a New Product of Chemistry

Digested from CHEMICAL WEEK, Aug 18, p80

Virus research has taken a new turn. Now a group of chemists in the U. S. A. is searching for broad-spectrum antiviral agents—single chemicals that will cure several different diseases. Theory behind their quest is logical. This is their reasoning:

Because of the large number of viruses—new ones are being discovered all the time—an equally large number of specific antivirus compounds would be needed to give broad protection. To complicate matters, diagnosis of virus diseases—identification of the virus causing the illness—is slow and not very accurate. The job of isolating all disease-causing viruses, then finding a chemical to combat each, is nearly impossible. Therefore, it is much more practical to seek chemicals that will kill (or inhibit) several types of virus at one blow.

The chemists think they have a good chance of finding the required chemical agents.

Considerable support for this view comes from Southern Research Institute, Birmingham, Alabama (U.S.A.), and from Upjohn Co., drug manufacturer of Kalamazoo, Michigan (U.S.A.). These organizations have produced new compounds that attack a broader range of viruses than previously known compounds. The new chemicals are not expected to be perfected for clinical use. But their discovery has raised hopes of finding medically useful multiple-purpose antivirals.

What makes the task difficult is the fact that viruses depend for survival and reproduction on certain metabolic mechanisms that are very similar to those of the host cells that the viruses invade. The problem is to find a chemical that is more toxic to the virus than to the invaded cell.

Thousands of compounds have been tested in numerous industrial and university laboratories in the U.S.A. Results are promising but not positive. Known antiviral substances include antibiotics, polysaccharides, analogues of amino acids, dicarbonyls and related compounds, acridine compounds, analogues of nucleic acid constituents, and benzimidazole derivatives.

Chemical researchers believe that chemistry—not vaccines—will prove to be the answer to virus therapy. They point to these disadvantages of vaccines: (1) Individuals must be vaccinated before contact with the virus. (2) Vaccination must be repeated at frequent intervals to maintain immunity, and this is rarely done voluntarily (but see below). (3) because of the great number of inoculations required for the individual, it would probably be impractical to depend on vaccines for

R.C.Allen Business Machines

FOR MODERN BUSINESS NEEDS

The superb R. C. Allen VisOmatic stands out as the world's most advanced typewriter. With exclusive VisOmatic (*visible* and *automatic*) Margins, keyset tabulation, interchangeable platen, long-life ribbon, and many other outstanding features, R. C. Allen typewriters are preferred for all business typing. Yet, they cost far less than you would expect for such superior performance. Available with Spanish, French, German, Italian, and other language keyboards, as well as English. Carriage widths from 11 to 26 inches.

R. C. ALLEN CASH REGISTERS

provide complete protection, convenience, and business information. There are manual and electric models designed for every type of retail business, and all R. C. Allen cash registers are *two-in-one* machines. They can be used as an adding machine as well as a cash register, and are unequalled in features and value. Multiple-total and multiple-drawer models are also available.

For full information about R. C. Allen Typewriters, Cash Registers, Adding and Bookkeeping Machines, call your nearest R. C. Allen Dealer. Distributors are located in principal cities throughout the world.

Exclusive sales franchises are available in a few areas . . . write for details.

R.C.Allen Business Machines, Inc.
EXPORT DIVISION:
450 Fourth Avenue • New York 16, N. Y., U. S. A.
GENERAL OFFICES: Grand Rapids, Michigan

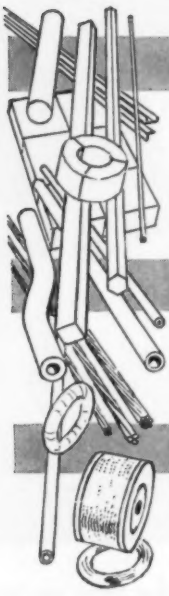
Look to . . .

COPPERWELD STEEL INTERNATIONAL CO.

COPPERWELD

FOR

Highest Quality
Dependable Service
Prompt Shipment



STEEL

CARBON, ALLOY AND STAINLESS STEEL BARS
COLD ROLLED STEEL SHEETS
STAINLESS STEEL SHEETS AND PLATES
BAR SIZE ANGLES AND CHANNELS
DEFORMED CONCRETE REINFORCING BARS

TUBING

CARBON, ALLOY AND STAINLESS STEEL TUBING
—WELDED AND SEAMLESS
FABRICATED AND FORGED STEEL TUBING

WIRE and CABLE

ELECTRICAL CONDUCTORS
TELEPHONE AND SIGNAL WIRES
GUY AND MESSENGER STRAND
GROUND RODS
FINE WIRE

POLES, CROSSARMS, INSULATORS, HARDWARE AND TOOLS
FOR CONSTRUCTING AND MAINTAINING OVERHEAD LINES

If you use any of the above products, it will pay you to make Copperweld Steel International Company your source of supply. By doing so, you can be certain you'll always get material of the highest quality to fully meet your specifications. You'll like our quick delivery and the personal attention we give every order—large or small. We would welcome an opportunity to quote on your requirements and to demonstrate the meaning of real service.

COPPERWELD STEEL INTERNATIONAL COMPANY

225 BROADWAY NEW YORK 7, N. Y.
U. S. A.

CABLE ADDRESS: COPPERWELD NEW YORK

protection against numerous virus diseases.

Those who believe that vaccines will eventually solve the virus problem counter the above by pointing out that chemical agents must be administered 72 to 24 hours before infection to be effective, and that after injection virus control with chemicals is more difficult. They claim, too, that it may be possible to develop vaccines that would be effective for the life of the individual, and that multiple vaccines might reduce the number of vaccinations required.

Dr. Carl Bunde, Medical director of Pitman-Moore Co., drug concern of Indianapolis, Indiana (U.S.A.), maintains that "it is conceivable that a single vaccine injection may protect against many strains." Pitman-Moore, a vaccine maker, is continuing to put its major research effort into vaccine experimentation.

Drug firms—and many of them are working with both chemicals and vaccines in their antivirus research—do not believe that a successful chemical antiviral would be very profitable for the seller. One firm says it "would be a good prestige item but not a profit item due to high cost." (Everyone admits, though, that an effective remedy for the common cold would doubtlessly reap a rich profit reward.)

The pace of research quickens, meanwhile, as the chemical-versus-vaccine dispute goes on unchecked by final achievement. An intensive virus identification and classification program was launched recently at the National Institute of Health, Bethesda, Maryland (U.S.A.). A virus "synthesis" was reported a few weeks ago by the University of California, Berkeley, Calif. (U.S.A.). Researchers at both places firmly believe that the chemotherapeutic principles so successfuly applied to bacterial diseases will soon become equally effective against viruses.

A number of chemicals have already shown antiviral activity in tests with tissue cultures, embryonated eggs, and laboratory animals. Even though none of these compounds are practical for treating virus diseases, they serve as signposts along the road to virus chemotherapy. ●

What's New In World Research

FIRST INDUSTRY-SPONSORED nuclear reactor will produce short-lived radioisotopes and study chemical effects of radiation. It is U.S. industry's own reactor; experiments will be free of security restrictions and military competition. The reactor was built by Atomics International, a division of North American Aviation Co. on Armour Research Foundation ground. A number of U.S. companies sponsored the project.

The reactor is a homogenous, water-solution type. Studies contemplated include:

- Production of short-lived radioisotopes for tracer studies of fluid flow, materials transfer, mixing.
- Radiation effects on chemical reactions, plastics. *(Chemical Engineering, Sept, p122)*

●

SINGLE ATOMS were photographed for the first time by scientists of the U.S. Air Force. An ion emission microscope was the device used to photograph tungsten atoms in the solid state. *(Aviation Week, Aug 6, p325)*

●

BRITISH RESEARCHERS have found a way to make steel without a blast furnace. The new process, called Cyclosteel, blows fine droplets of liquid iron ore through a gas (powdered coal and oxygen). The result is a crude form of steel. A 1,600°C. temperature is generated and the reaction is violent. Experiments with the process are being conducted by the British Iron and Steel Research Association. *(Digested from various sources)*.

●

RESEARCH BRIEFS: Speech typewriter that will type out spoken words in conventional letters has been prophesied by RCA Laboratories . . . **Cancer of the breast** and other soft tissues can be detected with a kind of radar that uses very high energy sound waves. Doctors at St. Barnabas Hospital (Minneapolis, Minn.) say the method is better than using X-rays. *(Digested from various sources)*.

9 features put the "99" on top!

Never before has so much "business sense" been built into the compact shell of a Printing Calculator. The Remington "99" speaks for itself — ask for a demonstration in your office or ours. See your local telephone directory for your nearest Remington Rand representative. There are 18,000 Remington Rand Branches and Distributors throughout the world.

10 KEYS

14 COLUMN CAPACITY

PRINTS ALL TOTALS IN RED

PRINTS ESSENTIAL ELEMENTS ONLY

DELIVERS PRINTED PROOF

ADDS

SUBTRACTS

MULTIPLIES

DIVIDES

Remington Rand

International

DIVISION OF SPERRY RAND CORPORATION

X-RAY IN ACTION: **Mechanic (left) places X-ray film inside wing structure of aircraft; portable unit (right) is positioned for X-raying part of airliner's wing surface. Result: greater safety, savings.**

Portable X-Ray: Money-Saving Tool

Have you a difficult "non-destructive" inspection problem in your plant? Is your method of checking parts and components slow, expensive and not too efficient? An economical answer may be portable X-ray equipment.

Today the aircraft industry is leading the way in new uses of X-ray. Companies like United Airlines (U.S.A.), KLM Royal Dutch Airlines, and Vickers-Armstrongs Aircraft, Ltd. (England), are saving money and gaining efficiency by using portable X-ray. They use it for specialized jobs such as inspection of complete contour air ducts, 360 degree inspection of fuel vessels, and for many other small-area assemblies.

At least 15 more of the world's major airlines, as well as airplane manufacturers in Europe and America, are using portable X-ray machines. In the past few months, airlines experts from around the world have gathered at two big conferences — one sponsored by General Electric Co. in Highland Park, Illinois (U.S.A.), and the other by Carl Drenck X-ray Laboratories in Copenhagen, Denmark —to exchange ideas and information on use of X-ray in the aircraft industry. Indication is that other industries will soon give more attention to this tool.

Several of the leading manufacturers of portable X-ray equipment are:

- Andrex—Three sizes of equipment manufactured by Holger Andreasen Co., Copenhagen, Denmark.
- Norelco—Three sizes made by C. H. G. Muller Co., Hamburg, Germany.
- General Electric—One size is available through General Electric X-ray Dept., Milwaukee, Wisconsin, U.S.A.
- Baltograph—Four sizes are on the market, distributed by Westinghouse Electric Co. (Industrial Products Division, X-ray Sales Dept.). Machines are made by the Balteau Electric Corp., Stamford, Connecticut (U.S.A.). Transformers used in this equipment are made in Liege, Belgium, by Balteau and shipped to the U.S.A.
- Fedrex—Four sizes are available. Maker is Carl Drenck Electro-Technical Laboratories, Copenhagen, Denmark.

Each of the above models can be carried by one or two men. Some units are extremely small and compact. The "sets" are comprised of X-ray heads, remote control units, and connecting cable.

Users report that the equipment saves time and (in the case of aircraft) gets planes out of overhaul and into the air quicker. Inspection manhours—and therefore payrolls—are reduced. Quality of inspection is improved. In some cases, X-ray performs inspections that could not be handled visually.

X-ray enables inspectors to locate concealed structural defects that might otherwise go undetected —cracks, breakage, corrosion. An example is a recent experience of KLM Royal Dutch Airlines. Company technicians were X-raying insulated anti-icing ducts in an aircraft stabilizer. Three radiographs revealed that a Y-section had

broken loose (inside the stabilizer) and moved five feet out of place. The radiographs, actually made to detect cracks in the insulated ducts, located the Y-section defect purely by chance. "The defect would have gone unnoticed," say KLM officials. "The experience helped convince us of the value of portable X-ray in inspection . . ."

Savings made possible by portable X-ray can be seen in a report from Pan American World Airways. PAA saves over 46,000 manhours a year at its Miami (Florida) Overhaul Base by using portable X-ray to inspect emergency exit hinges on planes, propellers, and part of wing surfaces. PAA reports "greatly increased efficiency" in plane maintenance and repair. The company plans to expand use of portable X-ray. ●

What The X-Rays Show

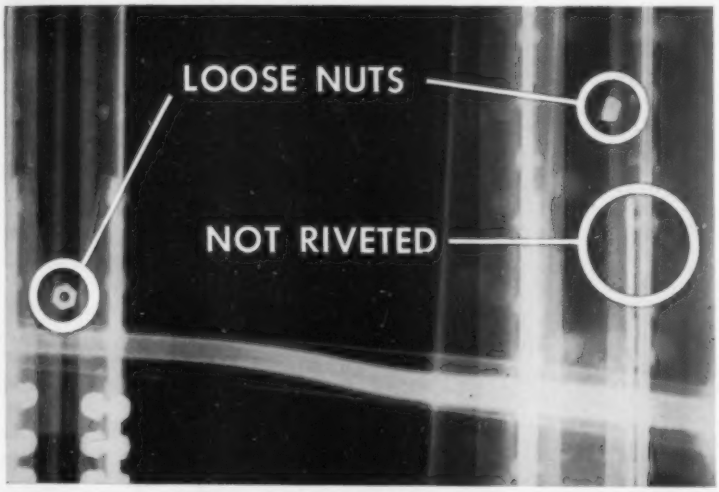
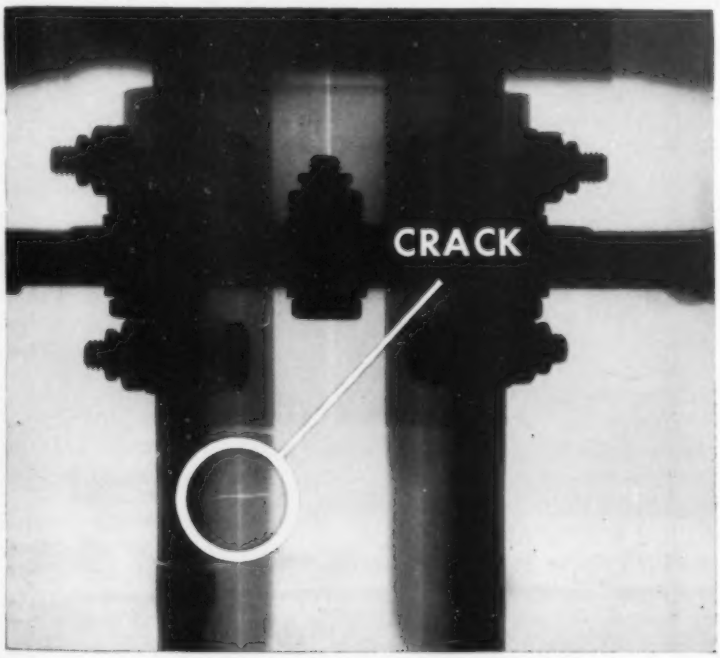


PHOTO shows unriveted plate (big circle) and two loose nuts, in side wing.



CRACK in vital airplane part shows up as fine white line, colored circle.

Machine Tool Control Unit Saves Manhours

A nickel rod that creeps along like an inchworm is the key to a new system for controlling centerless grinders and other precision machining operations. The creeping action of the rod permits the unit to feed work accurately against a grinding wheel or cutting edge in steps as small as five-millionths of an inch.

The unit, called the "Inchworm Motor," is manufactured by Airborne Instruments Laboratory, Inc., Mineola, New York (U.S.A.). Operation is self-correcting. An electronic control device calculates the rate of wear on the grinding wheel, makes automatic corrections in the workpiece position.

The inchworm controls can help cut manpower requirements in many machining operations. On centerless grinders, operators have had to make corrections as the grinding wheels wear down—without knowing if they have made the right corrections until parts are finished and checked.

The new self-correcting system automatically gages the parts coming out of the machine, sends this data to the electronic control unit for automatic correction.

Such automatic operation could mean a lot to medium-sized machine shops making relatively small numbers of specific parts. A man can set up a machine, and it will run off 100 or 200 parts while he sets up a machine for the next operation. The Inchworm Motor can be adapted for many jobs on existing equipment.

people just can't resist products of UNION CARBIDE polyethylene

TRADE-MARK

With finished products molded or extruded of versatile UNION CARBIDE polyethylene, you can draw customers almost magnetically, and greater sales mean rising profits for you. Whether ease of handling in production or building greater customer loyalty for your products, UNION CARBIDE quality—the invisible ingredient—*works* for you.

The lightness, toughness and modulated flexibility-rigidity of UNION CARBIDE polyethylene, combined with its chemical and abrasion resistance, adapt it to a wide variety of uses. From wire insulation and film for packaging to water pipe and squeezable bottles, or in the ever widening range of future applications, you can mold more quality into your products with UNION CARBIDE polyethylene plastic materials.

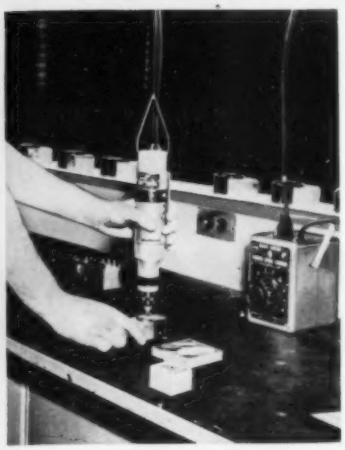
New facilities for the production of UNION CARBIDE polyethylene are making increasing quantities available for sales-conscious producers of plastic finished products. For further information on how polyethylene can serve you and your customers, write for booklet PM-10 "UNION CARBIDE Polyethylene".

UNION CARBIDE
TRADE-MARK
PLASTICS

UNION CARBIDE has distributors in principal cities throughout the world.

PLASTICS DEPARTMENT
UNION CARBIDE INTERNATIONAL COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, New York, U.S.A.
Cable Address: UNICARBIDE, New York

The term UNION CARBIDE is a trade-mark of Union Carbide and Carbon Corporation.



Screwdriver Attachment Controls Power and Speed

This Power Speed Control, coupled to a Black & Decker Scrugun or Screwdriver, makes possible an infinite number of speed and power adjustments, to drive screws far smaller than those for which the tool was designed. As an example, the B&D No. 8 Scrugun independently drives screws of a No. 8 size. When combined with the Power Speed Control (at right), adjustment can be set by dial, and screws down to a No. 0 size can be driven.

The unit is useful in precision industries, where extremely fragile screws must be production-driven without injury to delicate materials such as ceramic, plastic, and glass. **(Black & Decker Mfg. Co., 600 East Pennsylvania Avenue, Towson 4, Maryland, U.S.A.)**

●

Moves Freight Cars Easily

A double-drum car puller will move and spot freight cars on railroad siding. The machine is claimed to be simple, and inexpensive. The operator just presses pushbuttons, moving as many as 12 to 14 loaded cars along a double-track siding.

The puller consists of two cable drums, driven by an electric motor, through a gear reducer and a reversing mechanism. It offers several safety features, and is designed to keep maintenance costs low. **(Hewitt-Robins Inc., Stamford, Connecticut, U.S.A.)**

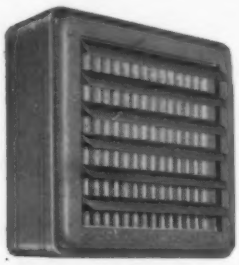
A New Mobile Crane

The 10,000-pound-capacity KE KARRY KRANE is reported to move any shape load that can be placed under its boom. It can work both within the plant, and in yard areas.

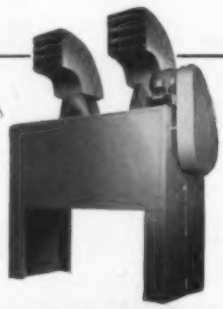
Power steering, trunnion-type steering wheels, short turning-radius, and rounded rear-end design enable the unit to maneuver easily and quickly in crowded areas. Boom lengths of 9, 10 and 12 feet are available with optional counterweights. Visibility is said to be excellent in all directions. **(Hyster Co., 2902 N.E. Clackamas St., Portland 8, Oregon, U.S.A.)**

A complete line of Industrial Heating Equipment

VERTICAL UNIT HEATERS — ceiling-mounted units force heated air over a wide area. Modern styling; all moving parts enclosed. For further details request Bulletin 7517.



VENTURAFIN UNIT HEATER — for horizontal blow. High-volumetric capacity; adjustable louvers. Designed for factories, garages, warehouses and commercial buildings. Described in Bulletin 7517.



INDUSTRIAL HEATERS — for large, hard-to-heat plants, airplane hangars and shops. Complete data available in Bulletin 5917.

AMERICAN BLOWER CORPORATION

Detroit 32, Michigan, U.S.A.

Division of American-Standard

This Equipment Can Also Be Furnished By

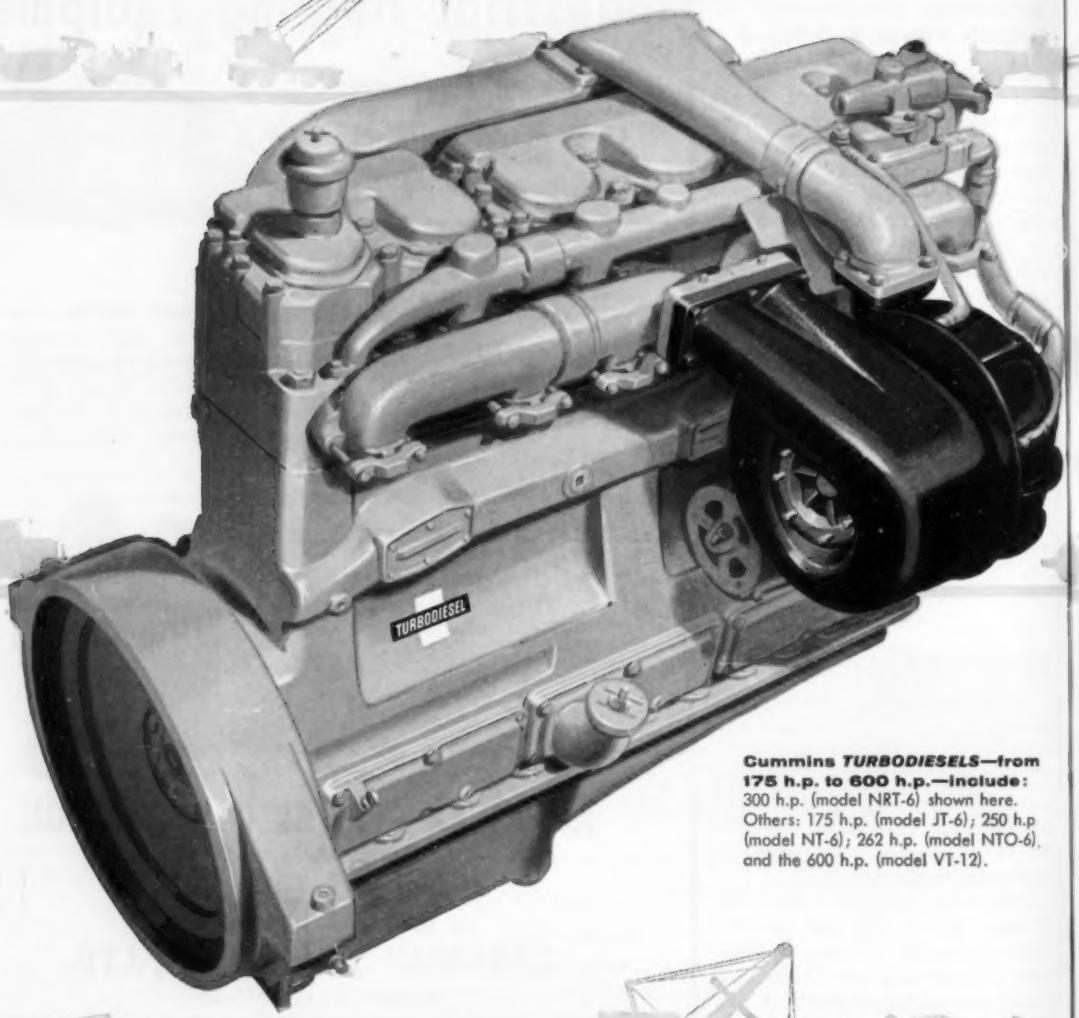
CANADIAN SIROCCO CO., LTD.

Windsor, Ontario, Canada

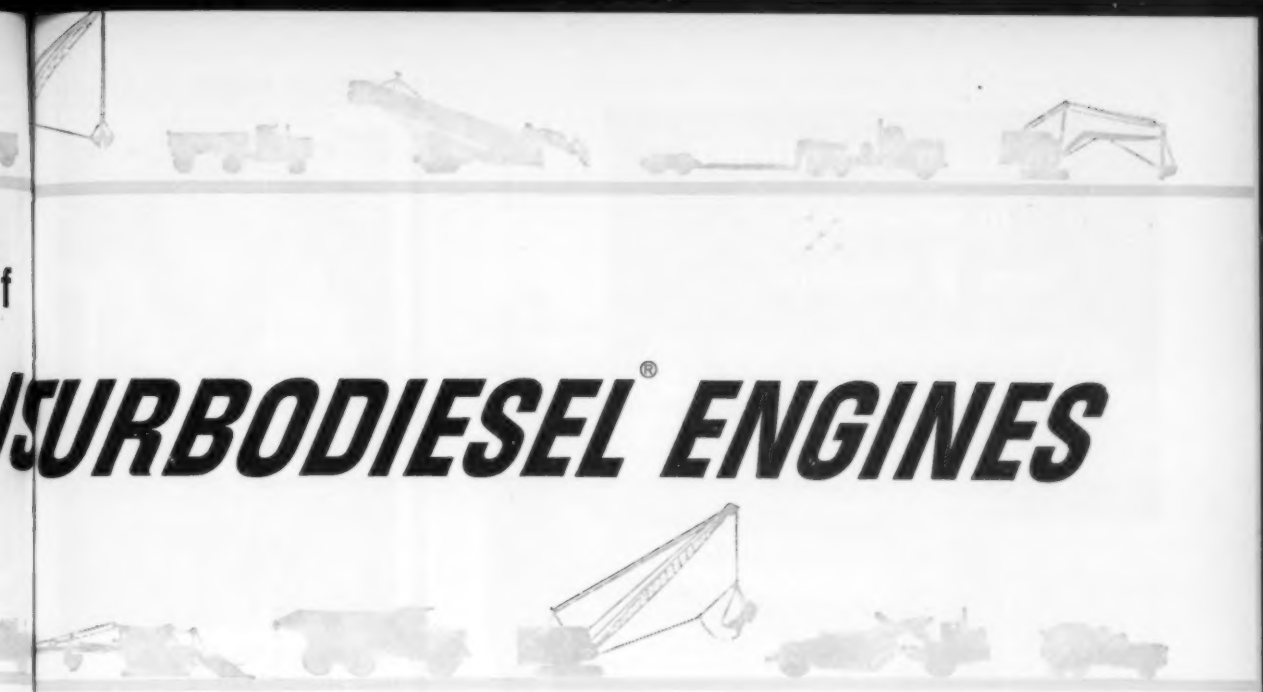
Blowers • Fluid Drives • Unit Heaters • Centrifugal Compressors • Dust Collectors
Air Conditioning • Mechanical Draft Equipment • Refrigerating Machines • Fans

now available (from 175 h.p. to 600 h.p.)**...a complete line of**

CUMMINS



Cummins *TURBODIESELS*—from 175 h.p. to 600 h.p.—include: 300 h.p. (model NRT-6) shown here. Others: 175 h.p. (model JT-6); 250 h.p (model NT-6); 262 h.p. (model NTO-6), and the 600 h.p. (model VT-12).

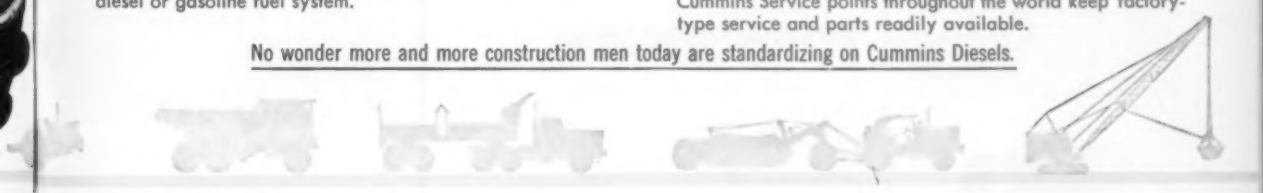


ISURBODIESEL® ENGINES

POWER!.....PERFORMANCE!.....PROFIT!

- Turbocharging—Exhaust gas energy normally wasted is now utilized . . . boosting usable horsepower at the flywheel.
- Cummins-built Turbocharger—designed and manufactured by Cummins, is matched to engine to give maximum performance and fuel economy . . . easily serviced in the field.
- Simplest Fuel System—Cummins exclusive PT fuel system is foolproof . . . simpler and easier to service than any other diesel or gasoline fuel system.
- Finest Dirt Protection—Sealed, pressurized crankcase and high-efficiency filters give long engine life under most severe dirt conditions.
- Simple, Rugged Design—Cummins famous heavy-duty engine construction means more operating hours between overhauls.
- Worldwide Service and Parts Protection—Nearly 300 Cummins Service points throughout the world keep factory-type service and parts readily available.

No wonder more and more construction men today are standardizing on Cummins Diesels.



CUMMINS gives you the big plus **MORE PROFIT**

MAIL THIS COUPON TODAY!

Cummins Diesel Export Corporation
Columbus, Indiana, U.S.A.
Cable: CUMDIEX

I am interested in obtaining more information about the advantages of Cummins Diesels. Send me the following *free* booklet(s).

_____ "The Cummins PT Fuel System"

_____ "More Profit with Cummins *TURBODIESELS*"

_____ "Answers to Questions about Diesels"

Name_____

Company_____

Address_____

City_____ Country_____

Get clear, dry COPIES
in seconds . . .
from 1 machine . . .
ANTARA

ANTARA Streamliner 400 — Low-priced, 2-step whiteprinter. Produces prints from originals up to 42″ wide (107cm), at speeds up to 24′ (7.3m) per minute. Automatic stacking and collating. Uses sheets or continuous roll stock. Convenient front delivery of copies.

Printmaster 810—Moderately priced whiteprinter for finest large-volume production. Synchronized developing and printing. Electronic fingertip controls. For prints from originals up to 42″ wide (107cm) at speeds up to 40′ (12.2m) per minute.

ANTARA O-M—Desk top model with many of the fine features usually found only on larger machines. Small in size, yet provides large-volume capacity. For copies and prints from originals up to 16″ wide (41cm) at speeds up to 30′ (9.14m) per minute.

Bambino—Low in cost and extremely economical to operate. No larger than a typewriter. Can make 200 copies an hour from originals up to 9″ wide (23cm) or from 8′ to 10′ (2.5 to 3m) per minute on continuous roll stock.

ANTARA SAVES TIME!

Now you can make *all* the copies you need *in just seconds* with the versatile ANTARA copying process. This method produces copies or prints of reports, charts, drawings, graphs, forms, letters, etc. . . . *anything* that is typed, written, drawn, or ruled on paper that is translucent (lets light through).

ANTARA SAVES MONEY!

Exact copies of originals cost less per copy than the price of your daily newspaper. They can be produced in colors, and on a variety of materials . . . paper, cloth or foil. And there's no need to buy carbon paper, duplicating inks, stencils, processing tanks, etc.

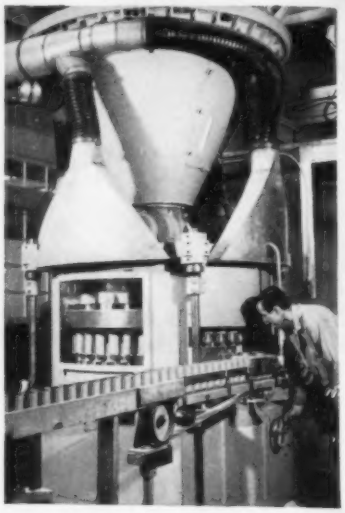
ANTARA SAVES EFFORT!

Anyone can use ANTARA. Just put in the originals, and out come the clear, dry, legible copies. There is *less* re-writing and re-typing . . . *never* any proofreading or corrections to be made. Confidential material can be deleted, or additional information can be added to any correspondence by merely changing the original. *Every* efficient organization should have an ANTARA machine . . . and there's a model that's exactly suited for *your* needs!

For information, write: ANTARA, Diazo Division, General Aniline & Film Corporation, Johnson City, N. Y., U. S. A.

ANTARA representatives are near you: LONDON, Ozalid Company, Ltd.; PARIS, La Cellophane S. A.; MILAN, Marri, S. R. L.; TEL AVIV, Eng. Joseph Lowenstark; BERNE, Multitec S. A. Berne; BRUSSELS, Etablissements Raoul Simon; OSLO, A/S Torrkopi; STOCKHOLM, Georg Bolle A/B; ISTANBUL, Burla Biraderler Ve Ssi.; ATHENS, Basil C. Lambiris; LISBON Portugal, Lima Mayer & Cia. REYKJAVIK, Einar J. Skulason; MANILA, Engineering Reproductions, Inc.

PRODUCT DIGEST (Cont.)



Can-Filling Machine Has High-Speed Accuracy

The Gilda automatic filling machine can fill over 300 one-pound cans per minute.

The machine is engineered to insure dependable, automatic operation. Several devices are incorporated to guard against jamming, overfilling, or other malfunctions resulting from faulty cans and other causes. Relative simplicity of the overall mechanism means simple maintenance, according to the manufacturer. It is possible to change quickly from one can height to another.

The product bin of the machine holds up to 40 cubic feet of material, and is equipped with a helicoid fluffer that prevents caking or "bridging," maintaining a homogeneous mixture at all times. **(Potter & Johnston Company, Newport & Potter Avenues, Pawtucket, Rhode Island, U.S.A.**

●

Compact Book Copier

The Apeco Panel-Lite Copier was designed to copy pages from books, magazines, and other material requiring a flat bed printer. It is styled to make snug contact with any bound page and to produce a sharp, clear copy. It measures 19½x13x4 inches. **(American Photocopy Equipment Co., 1920 W. Peterson Ave., Chicago 26, Illinois, U.S.A.)**

Hammers Balance Force In New Forging Machine

A machine for precision forging of shafts or tubes, based on the application of simultaneous blows from four hammers, has been developed. The machine can be equipped for automatic cycle—allowing up to eight different cross sections to be forged on one piece.

In the forging case are three to six eccentric shafts that revolve rapidly. The eccentric in the shaft transmits the forging force through a connecting rod to the hammer. Because all hammers strike at the same time, the forces are balanced and ground vibration is reduced.

The machine will forge solid and tubular shafting that requires contours or shoulders, axles, cylinders. **(GFM, Steyr, Austria.)**

•

Duplicator Speeds Copies

The Model 225 electric Azograph duplicator was designed specifically for systems work. Azograph employs colorless chemicals in place of aniline dye, assuring positive cleanliness.

The unit can be set for continuous feeding, or for single cycle feeding when it is desirable to feed individual cards or sheets of paper in accurate register.

The Model 225 is built for quick, easy loading, with parallel moving feed rails adjustable for various widths of paper. Dual corner separators feed a single sheet at a time—down to the last piece of paper on the feed table. **(A. B. Dick Company, 5700 Touhy Ave., Chicago, Illinois, U.S.A.)**

THIS CHAMP LICKS EVERY LIGHTING AND WELDING JOB!

BECAUSE THERE'S MORE GAS PER POUND

In The Familiar Green Drum
Of Shawinigan "S"
Brand Canadian Carbide

For more than fifty years Shawinigan "S" Brand Canadian Carbide, in its familiar green drum, has been used throughout the world to meet the most exacting job requirements. To be sure that the green drum you buy contains Shawinigan "S" Brand Canadian Carbide, look for the Shawinigan "S" trademark.

The quality of Shawinigan's many other chemicals is also helping industry to achieve higher standards around the world. Whenever, wherever, you need carbide or other organic chemicals to do a better job—always specify Shawinigan.

Acetic Acid
Acetic Anhydride
Acetylene Black
Butyl Acetate
Calcium Carbide
Dibutyl Phthalate
Ethyl Acetate
Monochloroacetic Acid
Butyl Alcohol

SHAWINIGAN
TRADE MARK REGISTERED

SHAWINIGAN CHEMICALS LIMITED

Shawinigan Building, Montreal, Que., Canada

Take it easy!

So many people in export-import and shipping wear themselves out doing things the hard way. You'll find that a lot of the usual troubles and annoyances simply melt away when you start routing cargoes through the friendly, efficient port of Newport News on Hampton Roads, Virginia—the second busiest harbor in America. At Newport News, the Chesapeake and Ohio tracks are alongside the ship. No drayage or lighterage. And there is also quite a saving on inland freight rates to and from most of the Mid-West and Mid-South.

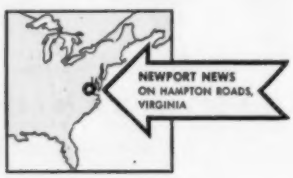
WRITE FOR FREE, ILLUSTRATED BOOKLET which tells you about all the facilities and advantages you can enjoy.

Chesapeake and Ohio Railway

WORLD COMMERCE DEPARTMENT, NEWPORT NEWS, VA., U.S.A.

World Commerce Dept. Offices

Chicago 4, Ill.....327 So. LaSalle Bldg.
Detroit 26, Mich...525 Lafayette Bldg.
Richmond 10, Va.....909 East Main St.
New York 7, N. Y.....233 Broadway
Stockholm, Sweden.....Kungsgatan 7



SHIP THROUGH NEWPORT NEWS, VIRGINIA
it's easier and saves dollars

More Light, Less Cost

The new "Power Groove" fluorescent lamp will give twice as much light per foot of lamp as previous fluorescents.

Indoors, the lamp will light high-bay areas, where fluorescents have not been practical because costs of installation, cleaning, and replacement were high. Outdoors, it will give ample light.

The new lamp will be available in early 1957. **(Int'l General Electric Corp., 150 E. 42nd St., New York 17, N. Y., U. S. A.)**

A New Plastic Film for Packaging

A new plastic film, which has strength and resistance to oil and corrosive fluids, is now available for heat-seal packaging of almost any material. The manufacturer claims it is possible to package oily products, drugs, chemicals.

The film is chemically inert and non-toxic; it is resistant to boiling and permeation of moisture and gas. It is heat sealable; bond is stronger than the film. Tensile strength is greater than 15 pounds per inch of width. The film is available in widths up to 22 inches and is 4½ mil thick. The price is quite a bit higher than cellophane. **(Minnesota Mining and Manufacturing Co., 900 Fauquier St., St. Paul 6, Minnesota)**

Automatic Machine Increases Billing Speed

The Model C. Computyper automatically computes and prints extensions, additions, deductions; all per cent increases and decreases, and totals.

With a few minutes training a typist should be able to complete the most complicated billing, and, at the same time, produce a common language tape for a number of subsequent data processing functions.

Program keys located at the base of a standard typewriter keyboard govern these automatic functions, including rounding off of fractional cents and printing of decimals. Because the printing of more than half the figures is automatically controlled without the operator touching the number keys, chances for error are reduced. **(Friden Calculating Machine Co. Inc., San Leandro, California, U.S.A)**

CONSULTING SERVICES

GOOD INVENTORY MANAGEMENT

Releases tied up working capital—gives better customer service—releases space for profit making activities.

INTERNATIONAL DIVISION

METHODS ENGINEERING COUNCIL

718 Wallace Ave., Pittsburgh 21, Penna USA

CONSULTANTS TO MANAGEMENT

DR. H. B. MAYNARD *Pres.*
DONALD E. FARR *Vice Pres. Latin. AM*

SAN FRANCISCO MADRID BUENOS AIRES
NEW YORK SANTIAGO GOTEBORG

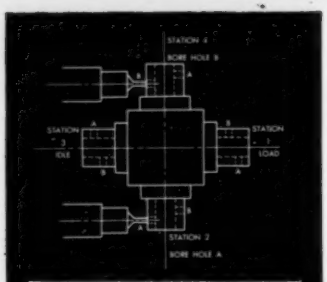
CONSULT THESE SPECIALISTS . . .

when you need professional assistance in solving difficult problems. Their specialized knowledge and broad experience can prove invaluable in saving both time and money for you.

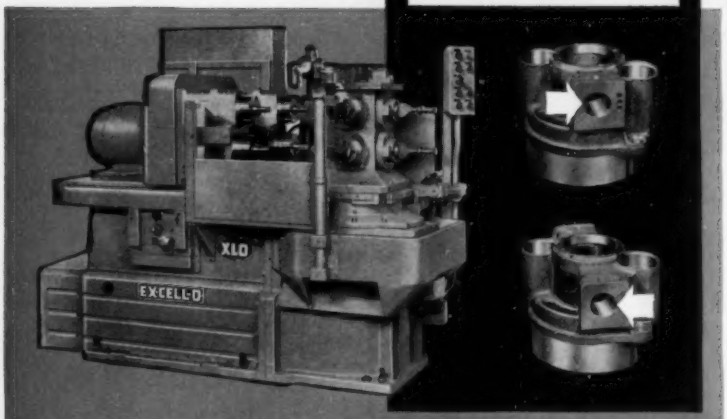
MANAGEMENT DIGEST invites other consultants to list the special services they offer on these pages.

BOOST PRODUCTION, CUT COSTS WITH

Ex-Cell-O Precision Way Machines



Plan view shows all four stations. Spindles are set off center to the fixture to machine cylinder bores A and B which are in different planes.



The Style 54 One-Way Machine equipped for boring, counter-boring and chamfering operations on compressor crankcases. The station nearest the push button panel is the loading station. Loading is done at this station during the machining cycle. On parts shown at right, the arrows indicate completed cylinder bores, emphasize difference in plane.

Ex-Cell-O machines are continually proving their ability for high production on many types of precision operations. One example is this standard Ex-Cell-O Style 54 One-Way Machine which bores, counterbores and chamfers compressor crankcases for refrigeration manufacturers.

Precision and high productivity at low cost are traditional features in all Ex-Cell-O machines; features which have persuaded leading manufacturers to rely on Ex-Cell-O for over 30 years. For full information on how Ex-Cell-O can help you: write or cable Ex-Cell-O in Detroit.

56-27

XLO EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN, U.S.A. CABLE ADDRESS: XLO, DETROIT, U.S.A.
PRECISION MACHINE TOOLS • CUTTING TOOLS • MACHINES TO PACKAGE MILK IN SANITARY PAPER CONTAINERS

PRODUCT DIGEST (Cont.)

Electronic Reader

The Film-a-record AO microfilm reader is designed to accommodate either 16 or 35 mm. microfilm to meet all requirements. Has interchangeable lenses. **(Remington Rand Inc., 315 Fourth Ave., New York 10, N. Y., U.S.A.)**

•

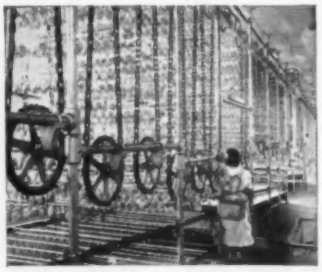
Flexible Ventilating Tubing

A new flexible tubing has been developed for ventilating workings and headings in mining operations. Known as "Ventube" #5740, it is constructed of nylon fabric coated with neoprene.

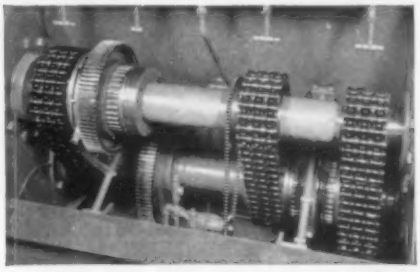
"Ventube" offers distinct advantages and economies over conventional flexible tubing. Flexibility and lightness make installation a simple operation. An unskilled worker can set up a new system. **(E. I. du Pont de Nemours & Co. Inc., Wilmington 98, Delaware, U.S.A.)**

LINK-BELT RESEARCH AND ENGINEERING...WORKING FOR INDUSTRY

This scene has its counterpart in mines, mills and factories. Link-Belt engineers work with equipment manufacturers in field studies which assure highly efficient conveying and transmission of power through use of chain.



Roller chain is often low-cost, practical answer to conveying as on this 1/5-mile long cookie dryer in a bakery.



Manufacturing extras in Link-Belt Roller Chain provide the efficiency required in this oil field drawworks transmission.

The most complete catalog of its kind, 148 page Book 2457 offers data to help you apply roller chain to equipment.

Quality bonus for quality machines

...provided by Link-Belt Roller Chain tailored to specific drive and conveying requirements

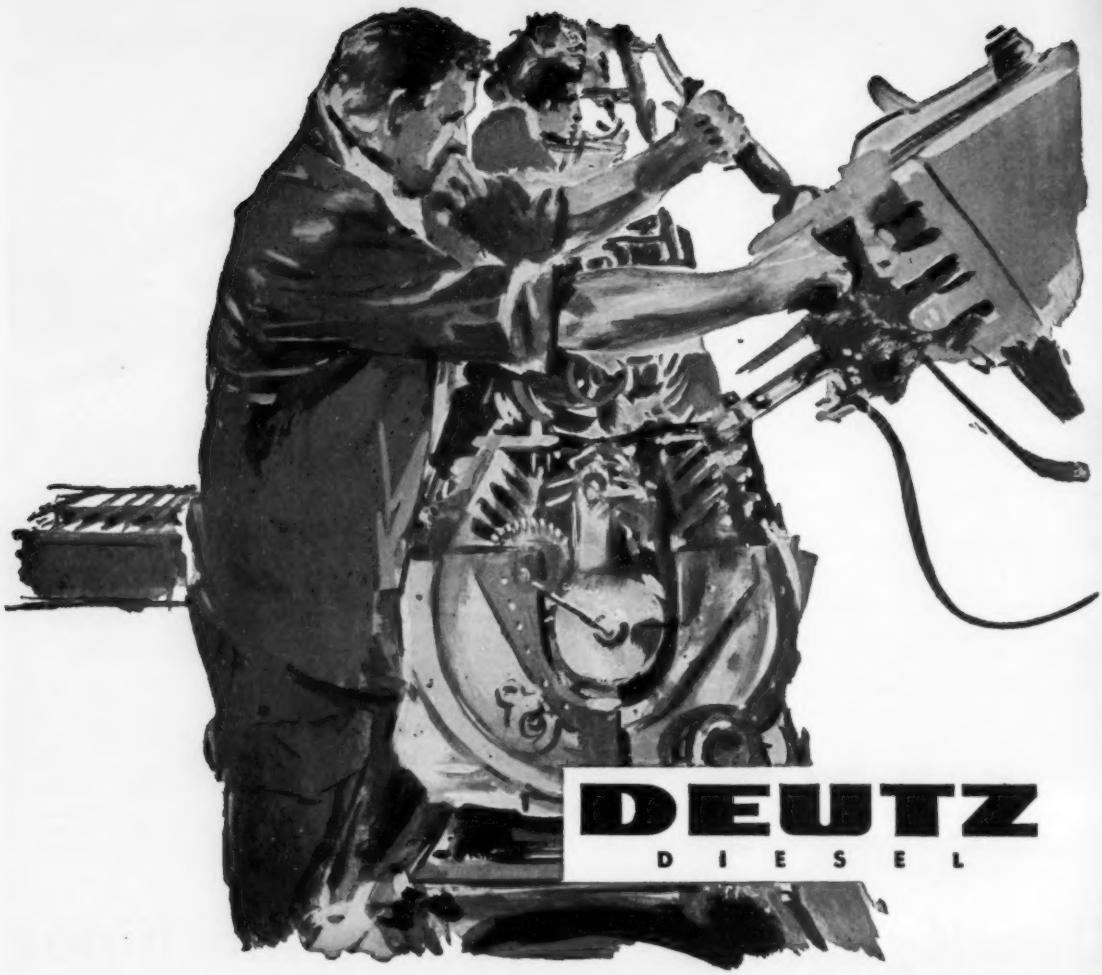
THE manufacturer who wants the benefits of roller chain applied to his product can profit by the unique application experience of Link-Belt. Our specialists devote full time to the particular fields of farm machinery, oil field production, automotive equipment, construction machinery and others. They consider every aspect including horsepower, hours of service, shock loading, arrangement of drives . . . recommend the proper size and type of roller chain.

The complete Link-Belt line includes silent, roller and all types of cast, combination, forged and fabricated steel chains. A Link-Belt engineer will give you an expert appraisal of your drive and conveying requirements. For complete engineering data on roller chain, ask your representative for Book 2457. Or write Link-Belt Company, Dpt. 10-MD 2680 Woolworth Bldg., New York 7, N. Y. 13,980-E

LINK-BELT

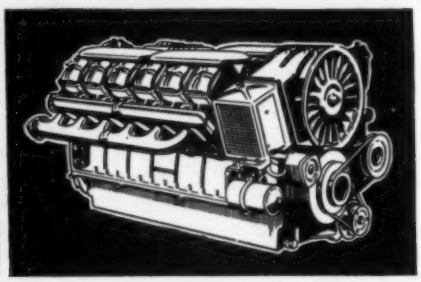
One source . . . one responsibility

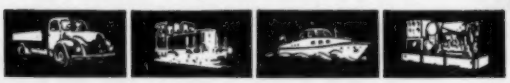
for materials handling | power transmission | processing machinery



air-cooled

began in 1948 to build air-cooled diesel engines in large series. 7 years after, in 1955, the oldest engine manufacturers in the world had built and sold 150.000 air-cooled DEUTZ diesel engines totalling 7.5 Million B.H.P. These equipment engines are used all over the world for every kind of application. DEUTZ builds air-cooled 1 to 12-cylinder diesel engines with an output range from 5 to 250 B.H.P. for road vehicles, rail vehicles, water craft, working machines in all fields of application, generator sets for stationary and mobile electric and power plants.





KLÖCKNER-HUMBOLDT-DEUTZ AG. KÖLN

GERMANY

▶ YOUR MANAGEMENT READING

Management Digest's editorial staff here again does the "worthwhile reading" for you to save your time. For the following literature, please write on your company letterhead directly to the address given, mentioning Management Digest.

Plan Your Research—Special Report No. 6 tells how to organize a research program, select projects, set up cost control, make the most of creative ability. Price $3.75. (American Management Association, 1515 Broadway, New York 36, New York.)

Picking a Plant Site—Management men with a flair for mathematics will find Plant Location—Theory and Practice useful. This highly technical book handles the location problem as a straight economic analysis, and examines the various factors involved. Price $7.50. (The University of North Carolina Press, Cape Hill, North Carolina.)

Chemical Processing—A new encyclopedia covers the practical aspects of the chemical process industries, lists definitions of technical terms. It should prove valuable to all who are actively engaged in chemical research and production, and anyone who is a supplier or customer of the chemical industry. Price $12.00. (Chemical Publishing Co. Inc., 212 Fifth Avenue, New York 10, New York.)

Bulletins from Industry—A complete, well-illustrated catalog (35 pages) describes the Schiess line of machine tools. (Schiess AG., Hansaallee 246, Dusseldorf-Oberkassel, Germany). . . . A useful discussion of diesel engine operation using the question and answer method. (Cummins Diesel Engine Co. Inc., Columbus, Indiana. . . . How to save time, money, and manpower through the "Guided Pallet" system of conveyor handling. This brochure emphasizes conveyor applications for products such as small appliances, furniture, business machines—other goods that require much processing and careful handling. (Rapids-Standard Co. Inc., Grand Rapids 2, Michigan.)

Energy from the Sun—A volume containing 30 papers, presented at the World Symposium on Applied Solar Energy, by authorities on all phases of the subject. Price $5.00. (Stanford Research Institute, Menlo Park, California.)

More on Automation—Here is a selection of new books on different aspects of automatic control in industry: Automatic Factory is a report by Britain's Institution of Production Engineers. Price 30 shillings (or $4.20). (E. & F. N. Spon Ltd. 22 Henrietta Street, London WC 2, England) . . . The Automatic Factory: A Critical Analysis was compiled by a Harvard Business School group. It discusses difficulties to be overcome before 100% automation can be achieved. Price $2.00. (Instruments Publishing Co., Pittsburgh, Pennsylvania). . . . Actual engineering and implementation of automation is the theme of Industrielle Automatisierungstechnik, published in German. Price 15 DM or $3.50. (VEB Verlag Technik, Berlin W8, Germany) . . . Keeping Pace With Automation surveys aspects of automatic processions in today's factory and looks at the possible effects of automation in the future. Price $3.75. (American Management Association, 1515 Broadway, New York 36, New York). . . . Indexbuchen der Technik contains summaries of 1,450 articles by 900 authors on the theory and application of automatic control. Written in German; it stresses European literature. Price 82 DM or $19.50. (Dokumentation der Technik, Zweibruckenstrasse 24, Munchen 8, Germany.)

Photograph by courtesy of The Automatic Telephone Co. Ltd., Liverpool.

The Fraser Tuson Vulture Scrubber and Polisher being used in its scrubbing role in conjunction with the Dipper Suction Drier leaving the floor perfectly clean, dry and ready for use.

DESIGNED & MANUFACTURED BY

Cimex-Fraser Tuson Ltd.

CRAY AVENUE · ORPINGTON · KENT

Publications Digested

McGraw-Hill Publishing Co., Inc., 330 W. 42nd St., New York 36, N. Y.

American Letter
American Machinist
Aviation Week
Business Education World
Business Week
Bus Transportation
Chemical Engineering
Chemical Week
Coal Age
Construction Methods & Equipment
Control Engineering
Electrical Construction & Maintenance
Electrical Merchandising
Electrical West
Electrical Wholesaling
Electrical World
Electronics
Engineering & Mining Journal
E&MJ Metal & Mineral Markets
Engineering News-Record
Factory Management & Maintenance
Fleet Owner
Food Engineering
Industrial Distribution
Ingenieria Internacional Construccion
Ingenieria Internacional Industria
Metalworking Production (London)
National Petroleum News
Nucleonics
Petroleum Processing
Petroleum Week
Power
Product Engineering
Textile World
The American Automobile
Today's Secretary

Advertising Publications, Inc.
200 E. Illinois St., Chicago 11, Ill.
Industrial Marketing

American Bankers Association
12 E. 36th St., New York 16, N. Y.
Banking

American Management Association
1515 Broadway, New York 36, N. Y.
The Management Review, Personnel, Supervisory Management

American Society for Metals
7301 Euclid Ave., Cleveland 3, Ohio
Metal Progress

Bill Brothers Publishing Corp.
386 Fourth Ave., New York 16, N. Y.
Sales Management

Breskin Publications
575 Madison Ave., New York 22, N. Y.
Modern Packaging *Modern Plastics*

Business Publications Ltd.
Mercury House, 109-119 Waterloo Road, London, S. E. 1
Business

Dartnell Publications, Inc.
4660 Ravenswood Ave., Chicago 40, Ill.
American Business

F. W. Dodge Corp.
191 W. 40th St., New York 18, N. Y.
Architectural Record

The Economist Newspaper, Ltd.
22 Ryder St., London S.W. 1, England
The Economist (London)

Fritz Publications, Inc.
431 S. Dearborn St., Chicago 5, Ill.
The Paper Industry

Harvard University
Soldiers Field, Boston 63, Mass.
Harvard Business Review

Industrial Publications, Inc.
5 South Wabash Ave., Chicago 3, Ill.
Ceramic Industry

Keeney Publishing Co.
6 N. Michigan Ave., Chicago 2, Ill.
Heating, Piping & Air Conditioning

Petroleum Press Service
91 & 93, Bishopsgate, London E.C. 2, England
Petroleum Press Service

Petroleum Publishing Co.
211 S. Cheyenne Ave., Tulsa 1, Okla.
The Oil and Gas Journal

Printers' Ink Publishing Co., Inc.
205 E. 42nd St., New York 17, N. Y.
Printers' Ink

Rubber and Technical Press, Ltd.
147 Grosvenor Rd., Westminster, London, S.W. 1, England
The Rubber and Plastics Age

Simmons-Boardman Publishing Corp.
30 Church St., New York 17, N. Y.
American Builder, Marine Engineering, Railway Age, Railway Track and Structures, Railway Locomotive and Cars, Railway Signaling & Communications

Temple Press Ltd.
Bowling Green Lane, London E. C. 1
Plastics, The British Motor Ship

The Times Publishing Co., Ltd.
Printing House Square, London, E. C. 4
The Times Review of Industry

Welding Engineer Publications, Inc.
12 East Grand Ave., Chicago 11, Ill.
Welding Engineer

Index to Advertisers

ADVANCE TRANSFORMER CO. 58
ALCO PRODUCTS, INC. 14
ALLEN BUSINESS MACHINES, INC., R. C. 61
ALLGEMEINE ELEKTRICITATS-GESELLSCHAFT... 5
ALLIS-CHALMERS MANUFACTURING CO., INDUSTRIES GROUP 20
ALLIS-CHALMERS, TRACTOR GROUP 1
AMERICAN AIR FILTER CO., INC. 58
AMERICAN BLOWER CORP. 67
ANDERSON CO., V. D. 55
BETHLEHEM STEEL EXPORT CORP. 12
BUNDY TUBING COMPANY ..... 4th Cover
BURROUGHS CORPORATION 23
CENTURY ELECTRIC CO. ..... 3rd Cover
CHAIN BELT CO. 46
CHESAPEAKE & OHIO RAILWAY 72
CIMEX-FRASER TUSON LTD. 78
CLARK EQUIPMENT INTL., C. A. 39
CLEMSON BROS., INC. 42
COMBUSTION ENGINEERING 60
COPPERWELD STEEL INTL. CO. 62
CORNING GLASS WORKS 27
CUMMINS DIESEL EXPORT CORP. 68, 69
EX-CELL-O CORPORATION 74
FORD MOTOR CO., LTD. 36
GENERAL ANILINE & FILM CORP. 70
GENERAL MOTORS OVERSEAS OPERATIONS.. 30
GLOBE HOIST COMPANY 25
HARNISCHFEGER INT'L CORP. 43
HEWITT-ROBINS INT'L DIV. 54, 55
HITACHI, LTD. 49
IBM WORLD TRADE CORP. 6
INTERNATIONAL GENERAL ELECTRIC CO. 9
KLOCKNER-HUMBOLDT-DEUTZ AG., KOLN.... 76
LINK-BELT COMPANY 75
MALLORY & CO., INC., P. R. 59
NATIONAL BROACH & MACHINE CO. ... 2nd Cover
NORDBERG MANUFACTURING CO. 40
REMINGTON RAND INC. 63
SHAWINIGAN CHEMICALS LTD. 71
STURTEVANT MILL COMPANY 4
TRACTOMOTIVE CORPORATION 31
UNION CARBIDE INTL. CO. 44, 66
WESTINGHOUSE ELECTRIC INTL. CO. 11
WILLYS-OVERLAND EXPORT CORP. 10
YODER COMPANY 2

•

CONSULTING SERVICES 73

This index is a service to readers. Every effort is made to maintain its accuracy, but MANAGEMENT DIGEST assumes no responsibility for errors or ommissions.

ABC...and the Reader

BACK IN 1914—forty-one years ago—a group of advertisers, advertising agencies and publishers joined in a project that has come to mean a great deal to the millions who, like you, read business magazines. The project, initiated at a time when circulation claims were rarely verified, was intended to achieve and maintain higher standards of integrity in publishing and advertising practice by providing means to audit paid circulation. Out of that effort came an orzanization known as the Audit Bureau of Circulations, a voluntary, non-profit, cooperative association, known for short as ABC. Its symbol appears at the head of this page.

We are proud that McGraw-Hill publications were among the founders and charter members of the Audit Bureau of Circulations.

Today the Bureau numbers 3,670 members. These include advertisers, agencies, and publishers of newspapers, farm papers, general magazines and business journals such as this one. These publisher members hold their memberships and their right to display the ABC symbol in their publications only so long as they live up to the circulation standards that are established through the Bureau.

It is one thing to set up high standards; it is another to see that those standards are maintained. This latter and all-important function is performed by a staff of auditors maintained by ABC to check periodically on the circulation practices of the publisher members. When a business magazine, such as this one, joins the Bureau it agrees that the ABC auditors shall have "the right of access to all books and records." Their inspection may dig into the files of original subscription orders, payments from subscribers, paper purchases, postal receipts, arrears of payments, editorial expenses and many other significant items. Sometimes the auditors go behind the records and seek verification of purchase and payment from subscribers themselves.

The information thus obtained and certified by the Bureau then becomes available to the public and constitutes an authoritative report on the publication's circulation practices.

The advertisers and agencies benefit directly from the ABC because it provides a generally recognized factual yardstick by which the circulations of member publications can be measured and appraised. Every paragraph in an ABC report on a business publication gives the advertisers data that help them make intelligent use of the publication as an advertising medium.

But the ABC renders a service of vital concern to the *reader* as well. The Bureau audits paid circulation only, and it is through this payment, whether by subscription or newstand purchase, that the reader keeps the editorial policy of a publication responsive to his needs. His decision to buy or not to buy records his judgment on each publication, and the ABC-audited and certified circulation reports make the sum of these judgments known to all concerned.

So the editors of ABC publications must constantly keep their editorial services up to the mark if they are to survive a competition in which the reader's right to buy or not to buy is paramount. Each paid magazine or newspaper will prosper or fail as it wins or loses the voluntary patronage of thousands or millions of readers. And—the ABC is scorekeeper in this vital contest.

Thus the publisher who submits his publication to the supervision and discipline of ABC affirms in the strongest possible manner his recognition that his primary obligation is to his readers and that he owes the standing of his publication to a voluntary demand by those readers.

All this is what makes the ABC brand on a publication so important to its readers. That respected symbol, testifying to the advertising value of the publication, serves also as a constant reminder to all concerned that the reader's willingness to pay for an ABC publication is the basic reason why it stays in business.

McGRAW-HILL INTERNATIONAL CORPORATION

Your choice of normal or low starting current...

with Performance-Rated

Century

HIGH TORQUE, SINGLE-PHASE MOTORS

Capacitor Motors... ½ to 20 H.P. provide high starting torque, high pull-up torque and require normal starting current. They are available in drip proof, dust proof and explosion proof enclosures.

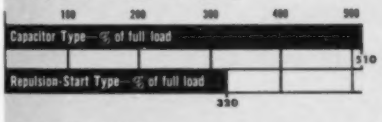
Even if you have severe starting current limitations, you can select the torque you need for sure starts and smooth pull-up to speed from the Century Performance-Rated Single-Phase line (see bar chart below for operating characteristics of two types of Century Single-Phase Motors).

Whatever Your Motor Job . . . there's a Century Motor Performance-Rated to handle it with top effectiveness. Write or cable for data and prices.

TYPICAL OPERATING CHARACTERISTICS

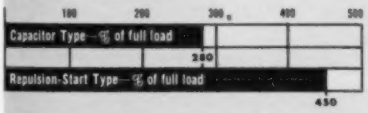
STARTING CURRENT

(Important on Heavily Loaded Circuits)



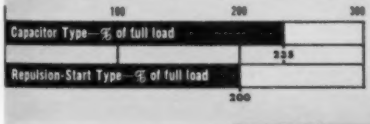
STARTING TORQUE

(Torque Available at Break-Away)



PULL-UP TORQUE

(Least Torque Available Between Start and Full Load Speed)



Repulsion Start, Induction Motors (type RS)... ½ to 7½ H.P. provide very high starting torque, yet require unusually low starting current. They are available in drip proof and splash proof enclosures.

Performance-Rated© Motors ⅛ to 400 H.P.

CENTURY ELECTRIC COMPANY

CE-32XE

1806 Pine Street, St. Louis 3, Missouri, U.S.A. • Cable Address: Onephase

1956

The "Rhino" goes *anywhere*—moves equally well on water or pavement, through mud, sand, swamps, or snow. With airtight hemispheroid wheels for floating, and tractor-like treads for sure footing, it opens the vast, roadless expanses of the world to easy exploration. Invented by E. P. Aghnides; built by Marmon-Herrington Company, Indianapolis, Indiana. Uses Bundyweld for oil, gas, gauge, and brake lines.

Fantastic, goes-anywhere vehicle relies on lifelines of Bundy Tubing

MAKERS OF RUGGED, special-purpose vehicles, such as this weird "Rhino," naturally call for the strongest, most reliable parts available. For dependable "lifelines"—fuel, oil, gauge, brake, and hydraulic lines—most manufacturers *specify* Bundyweld Steel Tubing.

Made by an exclusive process (see below), Bundyweld has become the accepted standard for the automotive and refrigeration industries. In fact, *it is used in 95% of today's cars, in an average of 20 applications each!*

Designers the world over look first to Bundy® for the finest in tubing, plus the engineering and designing assistance that make tomorrow's products better. New uses for Bundyweld are being found daily—in both fluid transmission and mechanical applications involving strength, flexibility, and low cost. Wire or cable Bundy, today!

BUNDY TUBING COMPANY
Detroit 14, Michigan, U.S.A.

WORLD'S LARGEST PRODUCER OF SMALL-DIAMETER TUBING. AFFILIATED PLANTS IN AUSTRALIA, ENGLAND, FRANCE, GERMANY, AND ITALY

WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of copper-coated steel. Then it's . . .

continuously rolled twice around laterally into a tube of uniform thickness,

and passed through a furnace. Copper coating fuses with steel. Result . . .

Bundyweld, double-walled and brazed through 360° of wall contact.

BUNDYWELD® TUBING

DOUBLE-WALLED FROM A SINGLE STRIP

- Sizes up to 5/8" O.D.
- Leakproof
- High thermal conductivity
- High bursting point
- High endurance limit
- Extra-strong
- Ductile
- Lightweight
- Machines easily
- Takes plastic coating
- Takes plating
- Shock-resistant
- No inside bead
- Uniform I.D., O.D.